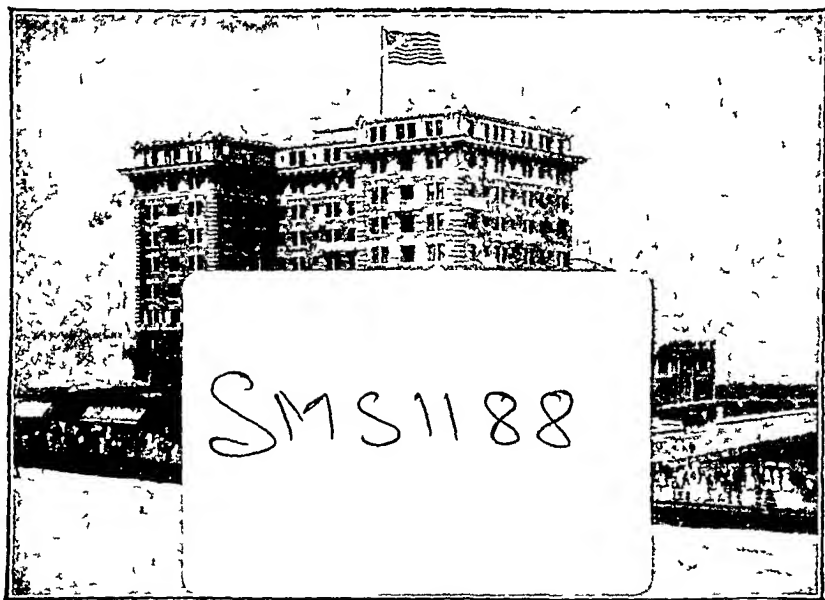


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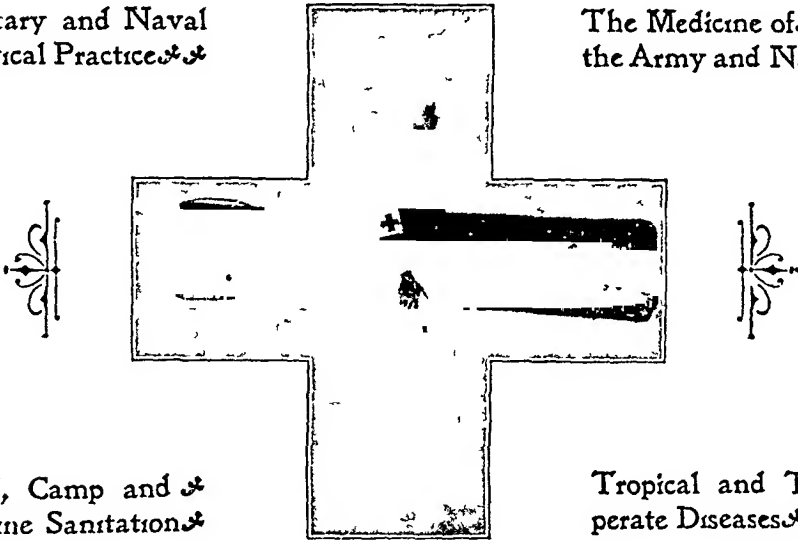
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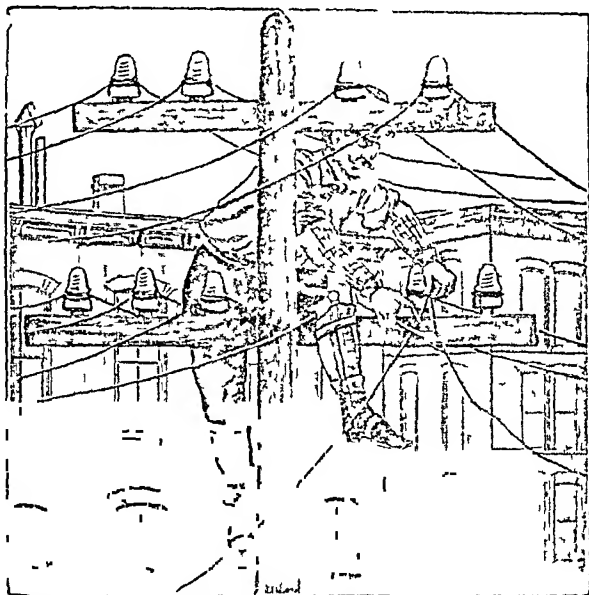
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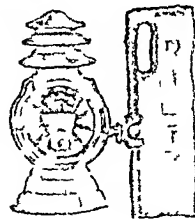


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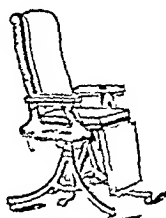
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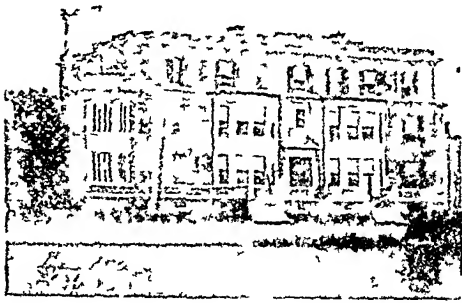
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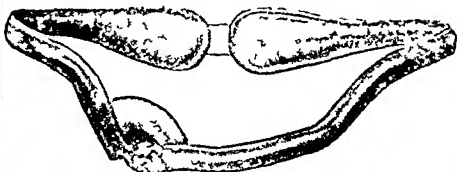
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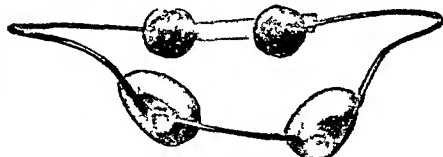
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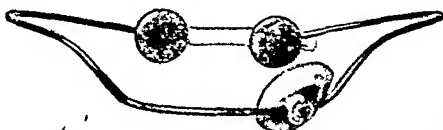
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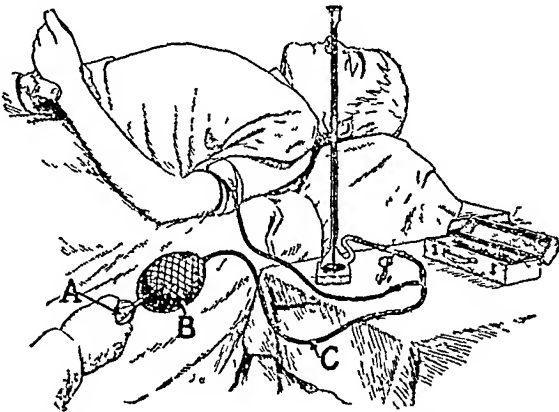
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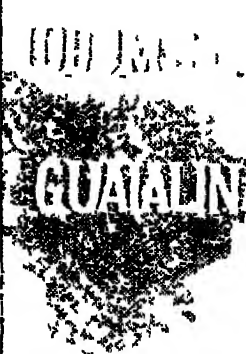


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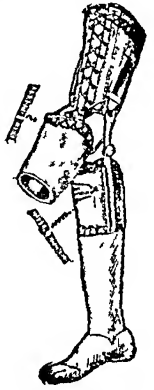
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ORIGINAL MEMOIRS.

ON PRESERVATION OF THE NERVE SUPPLY TO THE BROW, IN THE OPERATIVE APPROACH TO THE GASSERIAN GANGLION.

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JUDGING from the photographs that have accompanied the reports of cases operated upon by others, as well as from my own experience with the ganglion operation, an almost inevitable effect of the incision, as it is usually made, is a paralysis of the occipitofrontalis muscle (*pars frontalis*) due to the severance of the upper twig of the facial nerve. This highest branch of the "*Pes anserinus*" after crossing the zygoma on its way to the brow takes its course through the subcutaneous tissue overlying the temporal fossa, and thus traverses the direct field of approach to the ganglion. Just below and in front of it lies a separate branch destined to innervate the orbicularis, and some of the proposed methods of approaching the intracranial field of operation must necessarily sacrifice both of these upper twigs of the facial, and so lead not only to the deformity under discussion, but to impairment of the palpebral sphincter as well,—a matter of no small moment. It is

exceptional, however,—though the accident has been known to occur,—for the lower of these nerves to be injured either by the Hartley-Krause procedure or by the modification of their method which I have favored. Section of the upper twig, on the other hand, can hardly be avoided in making the usual horseshoe-shaped incision so commonly employed. Heretofore, so far as I am aware, no effort has been made to preserve this nerve, the operation in itself being considered so serious a one that such a trifling postoperative palsy as results from its division has hardly seemed deserving of attention. The deformity is not an obtrusive one, only showing when there is an effort to raise the eyebrows, or in old people by a planing out of the transverse folds of the brow on the side of the neurectomy (Fig 1). Nevertheless, as an operation develops, it is well to improve its technique even in the smallest details, and a modification of any operative procedure which can, even in slight degree, improve its cosmetic result, is most desirable, and this is especially so when a palsy of the expressional musculature is concerned.

In a recently printed paper dealing with this operation,^{*} comment was made upon this slight paralysis, and the opinion was expressed that an effort to save this small nerve would so further complicate an already complicated operation that the attempt would be injudicious. It was also noted that in a few of the cases of my series there had been a partial restoration of the power to elevate the brow, due, it was presumed, to the painstakingly exact approximation of all the divided tissues at the time the wound was closed. For, if unnecessary scar formation or the interposition of other tissue does not prevent, there is a natural tendency on the part of severed peripheral nerves to reunite and to re-establish connection with their old terminals. In the case, however, of such a long and delicate nerve as that under discussion, this good fortune can rarely be expected.

* "The Surgical Aspects of Major Neuralgia of the Trigeminal Nerve" Journal of the American Medical Association, March-April, 1905



FIG 1—Photograph of a patient in whom the highest branch of the facial on the left side has been divided, as in the usual temporal incision, to show the deformity under discussion. Note the sagging of the brow on the left side and absence of frontal wrinkles during the effort to look upward.



FIG 2—To show line of incision. Photograph taken on fifth day after operation. All sutures were removed on the second day, except the most anterior one as scar was almost invisible this one was left to delimit anterior end of incision in photograph. No drainage used.



FIG 3—Postoperative areas of anaesthesia, total within inner line. Scars of earlier peripheral operation observable under eye and angle of jaw.



FIG 4 — Two weeks after operation Almost total restoration of movement of occipito frontalis temporarily paralyzed in this case



FIG 5 — Photograph of tissues removed, showing intracranial portion of the fifth nerve intact Slightly reduced in size Under surface of ganglion

In my last five operations I have again turned my attention to the question of preserving this nerve, and have found, contrary to my expectations, that the incision and approach to the skull could be so altered as to avoid injuring it without adding particular difficulties to or modifying in any great respect the subsequent steps of the operation. Four of these cases have been total extirpations for major neuralgia, in the fifth I had to be satisfied with simple division of the sensory root of the trigeminus,—a case in which an inoperable sarcoma had grown up through the base of the skull under the ganglion, causing severe trigeminal pain. The malignant nature of the disease from which this patient was suffering rendered the question of cosmetic result far less important than in the neuralgia cases, and consequently the zygomatic arch was not removed, but in other respects the method of approaching the ganglion has been the same in each of the five cases.

The situation of the incision can be seen by consulting the accompanying photographs of one of the patients. It has been made within the hair margin, not for the purpose of concealing the scar, because these cicatrices are almost invisible after the operation, but, as has been stated, in order to avoid division of the nerve. The posterior limb of the incision is carried down to the zygoma over the temporal vessels, which usually must be ligated. The skin flap is then reflected downward and forward by blunt dissection, the handle of the scalpel sufficing for this purpose. The temporal fascia, thus exposed, is incised in a line concentric with the skin incision and likewise reflected. The zygoma, which has thus been brought into view at the lower angle of the wound, is then shelled out of its periosteal sheath, not as formerly described by making an incision along its external surface, but by crowding forward its coverings en masse. The exposed fibres of the temporal may then be divided as usual by a horseshoe-shaped incision, and the muscle scraped away with a periosteal elevator as far down as the base of the skull. In order to satisfactorily expose the skull, a little deeper retraction of the flap is necessary than by the older method, the ordinary small appendix retractor

being used for the purpose of holding down the cutaneous and fascial part of the flap as well as the muscle. From this point on the operation is conducted as heretofore described.

In the first of these cases, when the skin flap had been retracted, the nerve to the brow was exposed, and, though efforts were made to preserve it, it doubtless suffered injury through stretching during the downward retraction of the flap in the subsequent stages of the ganglion extirpation. Immediately after the operation it was found that the customary inability to elevate the brow was present, but the paralysis was of short duration, and before the patient was discharged from the hospital two weeks later, it had so far recovered that almost a symmetrical wrinkling of the two sides of the forehead was possible (Fig 3)

In the other four patients even this temporary palsy of the nerve was avoided, and the cases are so much alike that it is needless to give more than this one series of photographs to show the situation of the incision, which did not interfere with subsequent innervation of the occipitofrontalis, and at the same time allowed sufficient access to the ganglion to insure a total extirpation.

THE OPERATIVE TREATMENT OF CLEFT PALATE.¹

WITH A REPORT OF EIGHT CASES

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THE relative merit of the operative treatment of cleft palate as compared to the treatment with dental obturators, has long been a matter of dispute. It is not my purpose to enter into a discussion of this aspect of the subject, as my cases are too recent to exhibit final results as to improvement in speech, but rather to call attention to certain points in technique which aid in securing prompt surgical closure of the cleft with a minimum amount of damage to the muscles of the soft palate, so important an element in securing proper enunciation.

The Time to Operate — Children six or seven years of age are, I believe, the most favorable subjects for operation from the purely surgical standpoint. The mouth is sufficiently large, the loss of blood and shock make little impression on a child of this age, the patients are old enough to give intelligent assistance in the after-treatment and to be taught to wear the protective dental plate to be described later. The very serious disadvantage is that habits of speech are already formed and the defect in pronunciation is undoubtedly more difficult to overcome. Whether we can expect enough gain in this respect, in operations performed at three years of age and under, to counterbalance the increased danger from shock and hemorrhage, the greater difficulty of technique due to the small size of the mouth and the delicacy of the flaps, and the fact that the patient is unable to give any intelligent assistance in the after-treatment, I am as yet unable to determine, as my

¹ Read before the New York Surgical Society, October 25, 1905

experience in operating at this age is too limited and recent. With the operation in early infancy, ten days to three months of age, I have had no experience. Results in the hands of surgeons other than the originator of the method have certainly not been encouraging and a high rate of mortality is admitted. I have heard of no completely successful case operated upon in this city, and the published reports of the method which I have been able to find have been too vague and void of detail to afford any basis of comparison in regard to actual results.

Anæsthetic, Position and Gag—I have invariably used the hanging head, Rose position, intermittent ether anæsthesia with an open cone, and the Whitehead gag. I have never resorted to preliminary tracheotomy and do not believe that it should ever be necessary. In adjusting the tongue piece of the gag the tongue should be drawn well forward and to one side with a traction suture passed through its tip (see Fig. 1). If this is not done, as the tongue piece locks the base of the tongue is forced over the entrance to the larynx and breathing is interfered with. After the gag is in place the operator assures himself that breathing is unobstructed and regular before proceeding with the operation, if properly adjusted the gag need not be touched again until the operation is completed. The operator stands at the head of the patient, facing the feet, looking down on the palate from above. Blood and mucus collect in the naso-pharynx, which is easily kept clean by frequent sponging, and little if any blood should get into trachea or œsophagus.

Instruments—The special instruments used are the Whitehead mouth gag (Fig. 1), a very slender knife for transfixing the edge of the flap, pairing and splitting the edge of the uvula (see Fig. 2, I have used a cataract knife), a long slender pair of mouse-tooth forceps (Fig. 4), a strong, straight scalpel for making the lateral incisions, a thin, blunt periosteal elevator, slightly curved on the flat, a sharply curved Deschamps's handle needle (Fig. 8, a) for passing the heavier sutures, the author's special needle-holder and needles for the



FIG 1—Head in Rose position Whitehead gag in place with tongue drawn well forward and to one side

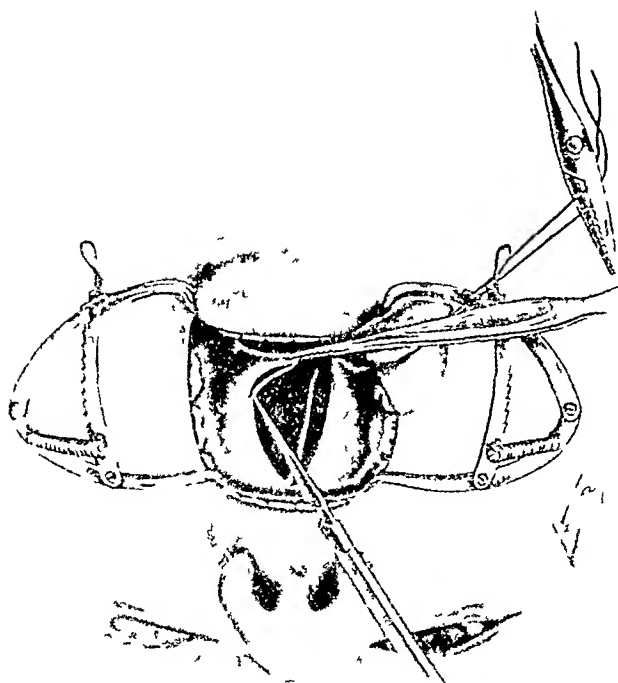


FIG 2 —Paring the edges of cleft the strip removed is very narrow and should terminate at base of uvula, the border of which is split this is not shown in the drawing

fine sutures (Fig 8, *b*, *c*, and *d*) This special needle-holder is rather an adjustable handle than a needle-holder proper, and was designed with the assistance of W F Ford & Co, to enable the use of the very finest needles, made with an eye in the point, in order to secure accurate apposition without damaging the delicate edges of the flaps The protective dental plates used in Cases VI and VII, first suggested I believe by Dr Porter, of Boston, were made from casts of the mouth taken before operation, by Dr Fiaschi They keep the tongue off the suture line and are a valuable aid in the after-treatment Children are easily taught to insert and remove the plate themselves without disturbing the flaps Fig 8, *e*, is a drawing of the plate used in Case VI

The Operation—The edges are paired by transfixing the edge of the soft palate with a very fine, sharp knife and cutting first forward to the anterior angle of the cleft, then backward, bringing the knife out at the base of the uvula, the strip removed should be as narrow as possible to avoid waste of tissue, but the full thickness of the flap (Fig 2) The mucous membrane of the uvula is then split on its inner border, *i e* facing the cleft, it easily separates to give a sufficient raw surface and all of the tissue of the rudimentary half of the uvula is saved This I believe to be an important modification of the method which I formerly employed, of removing a strip of tissue clear to the tip The denudation is repeated on the opposite side of the cleft

The lateral incisions are now made, commencing opposite the last molar tooth close to the border of the gums and carried forward to a point opposite the anterior extremity of the cleft, but taking great care to leave a broad anterior pedicle to the flap, for nutrition This incision falls external to the posterior palatine foramen and the main trunk of the artery as it runs forward, branches are first divided, the main trunk being usually torn by the periosteal elevator In clefts running forward through the alveolar process I prefer to leave the extreme anterior end of the cleft for later closure, rather than endanger the nutrition of the flaps by prolongation of the lateral incision

and narrowing of the pedicle Cases IV and VIII illustrate this condition

Hemorrhage is free but soon stops spontaneously or with pressure applied with gauze pads on holders while the anæsthetic is resumed

The curved periosteal elevator is then inserted in the lateral incision, and hugging the bone, is forced carefully through into the cleft, by lateral sweeps the entire flap is quickly separated, including the muco-periosteum at the anterior angle of incomplete clefts Posteriorly the instrument is strongly carried outward and backward (Fig 3) along the posterior margin of the hard palate, and to a great extent detaches the palatine aponeurosis and the mucous membrane on the nasal aspect of the velum from the bone In the majority of cases hemorrhage soon ceases to be troublesome after this blunt separation posterior branches of the descending palatine artery remain uninjured for nutrition of the posterior portion of the flap, even after very free separation with the aspiratory The inner edge of the flap is then seized with mouse-teeth forceps at the base of the soft palate, *i e* where the muscular pull concentrates (Fig 4, the forceps are shown grasping the flap too far forward), a thin, straight bistoury is inserted through the posterior part of the lateral incision, and cutting outward and backward as traction on the flap is made toward the median line, the detachment of nasal mucous membrane and palatine aponeurosis from the posterior border of the hard palate is completed, and by a careful sawing motion enough of the mucous membrane of the naso-pharynx divided to allow the edges of the flap to fall to the median line without tension Few if any of the fibres of the bellies of the levator or tensor palati are cut

The palatine aponeurosis which receives the insertions of the tensor and levator, is completely detached from the posterior border of the hard palate as far outward as the base of the hamular process, together with the mucous membrane on the nasal aspect of the soft palate, allowing the velum to drop downward This aponeurosis with its muscular insertions

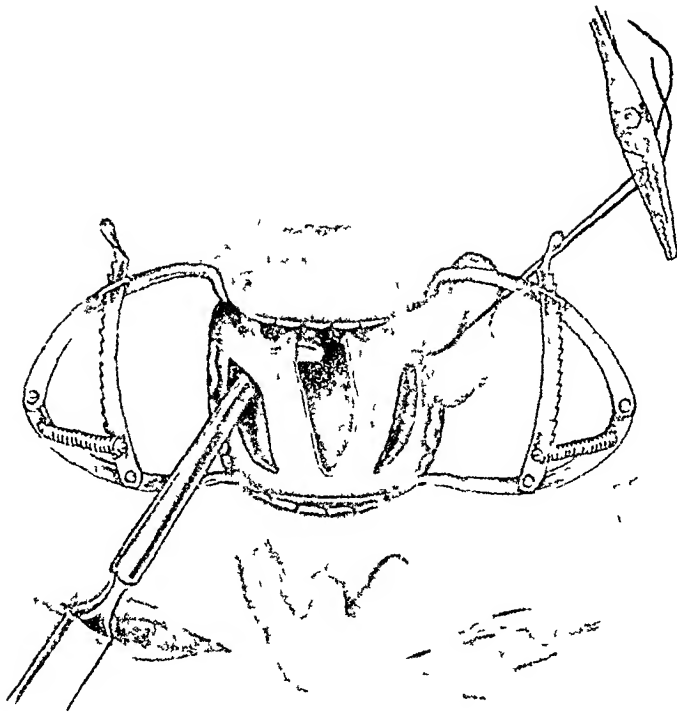


FIG 3 —Elevating the muco periosteal flap the lateral incisions have been made, the elevator is inserted through lateral incision

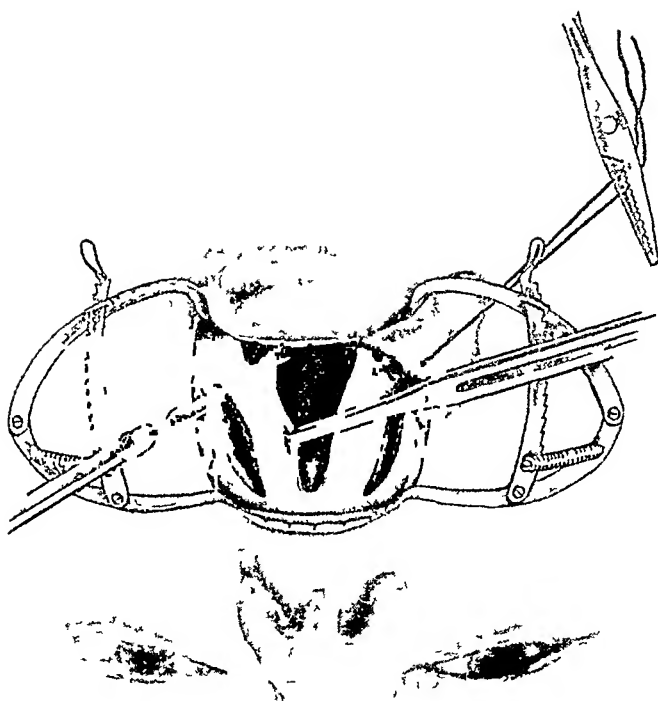


FIG 4 —Relieving tension by dividing palatine aponeurosis and mucous membrane on nasal aspect at posterior border of hard palate, bistoury inserted through lateral incision cuts outward and backward forceps shown grasping flap too far forward

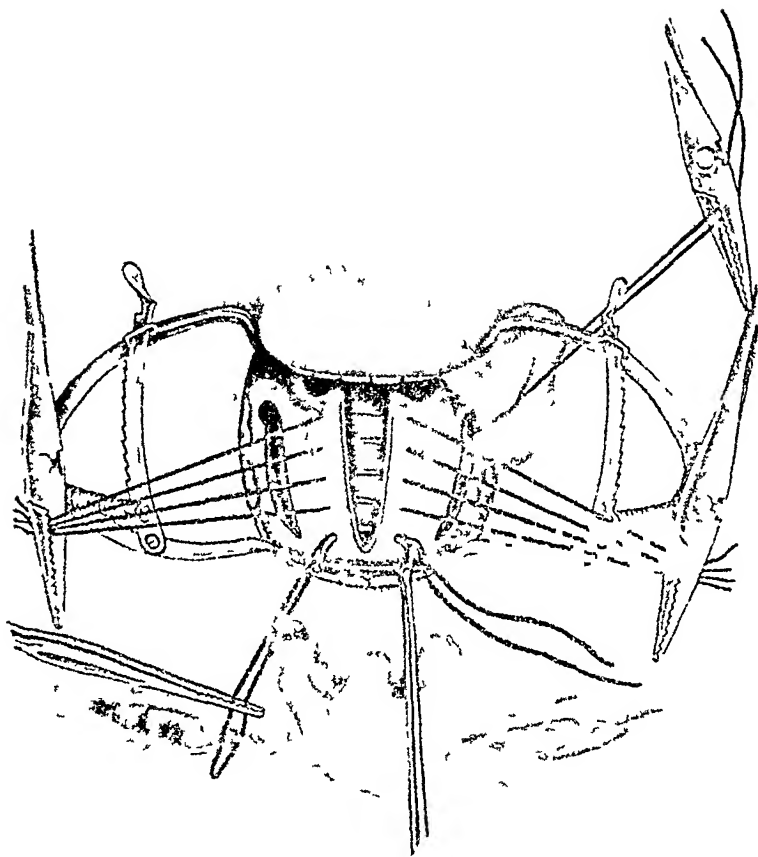


FIG 5 —Four of the heavy sutures passed and ends secured the fifth is being passed with the Deschamp needle, the loop grasped with thumb forceps as the needle is withdrawn

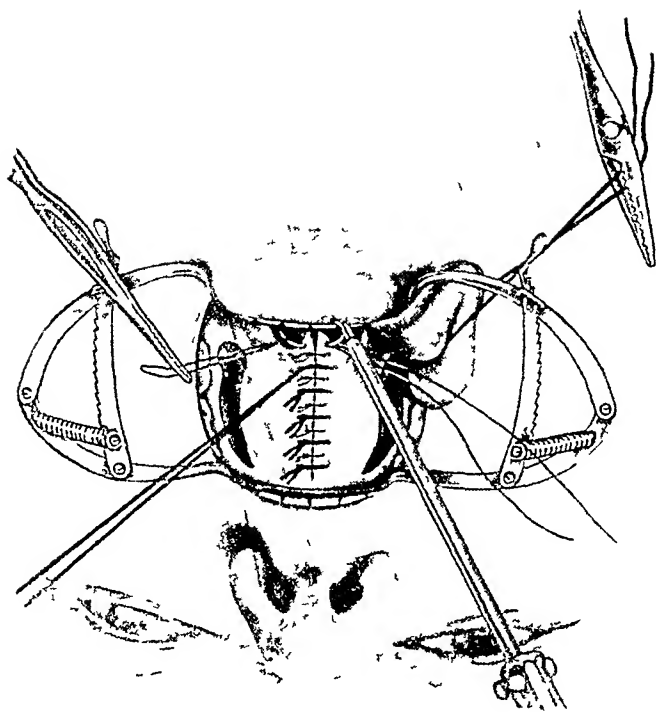


FIG 6 —The heavy sutures have all been tied the intermediate stitches have been passed and tied except the last one at tip of uvula, which is being passed with the fine special needle the end of the last heavy suture is left long for traction during suture of uvula

remains in the flaps. In cases of wide cleft, tension on the flaps is still caused by the shortened salpingo-palatine fold of mucous membrane running upward and backward on the lateral wall of the pharynx along the belly of the levator palati. Free division of this fold by gently tearing with the finger or snipping with blunt curved scissors as traction is made on the flap downward and inward to make it prominent, is easily accomplished without damaging the muscles, and effectually relieves tension. All this can be done without unduly narrowing the bridge of tissue behind, or endangering the nutrition of the flap.

By this time the hemorrhage has nearly ceased and the flaps are ready for suture. Beginning close to the base of the uvula, sutures of iron-dyed silk No. 6 are passed on the Deschamp's-handle needle through the entire thickness of both flaps at a sufficient distance from the edge to guard against cutting through, these are left untied until the last is passed, four or five being usually sufficient, placed one-fourth to one-third inch apart. They are then tied in order, with a surgeon's knot, usually beginning with the posterior stitch, the ends being left long for the time. Intermediate stitches of non-dyed silk No. 3 are then placed between each of the heavier stitches, and two or three in the uvula itself, the last at its tip or even on the nasal aspect. They are passed on the very fine special needles with eye in the point, carried on the special needle-holder, they include only part of the thickness of the flap, are closer to the edge, are tied immediately and insure accurate apposition of the edges, such as is aimed at in all fine plastic work. Five to seven of these are used, making in all ten or twelve sutures (Fig. 6). The long ends of the heavier sutures are used for traction and steadying the flaps during the passage of the fine sutures, especially in bringing the uvula forward (Fig. 6). Each, as it has served its purpose, is cut short.

The operation is now completed except for the treatment of the lateral incisions. Formerly I packed these with a strip of sterile gauze, bringing the end out at the angle of the mouth and attaching it to the cheek with adhesive plaster. In my last

two cases I have used a device suggested by C H Mayo a piece of white tape is passed around both flaps through the lateral incisions, drawn just tight enough to approximate the flaps slightly and guard against tension, and secured by a silk ligature The ends are cut short and slid around to the nasal surface of the flaps (Fig 7) This is left in place seven days and serves for drainage as well as the relief of tension, I have been much pleased with its effect in the two cases mentioned

The time required for the entire operation is about one hour, ranging from 55 to 65 minutes in six of my eight cases One case was completed in 45 minutes and one took two hours In none of my cases has the hemorrhage been at all alarming, nor has serious shock occurred

After-Treatment —I have made this very simple Sterile water is given by mouth with a spoon after the first twelve hours, feeding with sterilized milk, given in the same way at frequent intervals, is commenced at the end of 24 hours, and the quantity increased rapidly to full milk diet I have never resorted to rectal feeding and none of my patients has suffered seriously from lack of nutrition The lips, teeth and tongue are kept clean with boric acid solution, but no attempt is made to cleanse the palate or nasal fossæ I prefer to trust to the primary adhesion and disturb it as little as possible

The use of the protective dental plate made by Dr Frasci protects the suture line from the tongue, especially in the act of swallowing, and is of great value when the patient is old enough to allow its use It should be removed every three or four hours, cleansed in boric acid solution and replaced, preferably by the patient himself I first saw it used by Dr J A Blake Both of the cases in which I used it healed by primary union throughout, one of them having been operated upon three weeks before with total failure of union

When packing is employed in the lateral incisions it is removed on the fifth or sixth day and usually not replaced In the two cases in which I have employed the tape I have removed it on the seventh day Stitches are usually removed on the ninth or tenth day Many of the small defects which

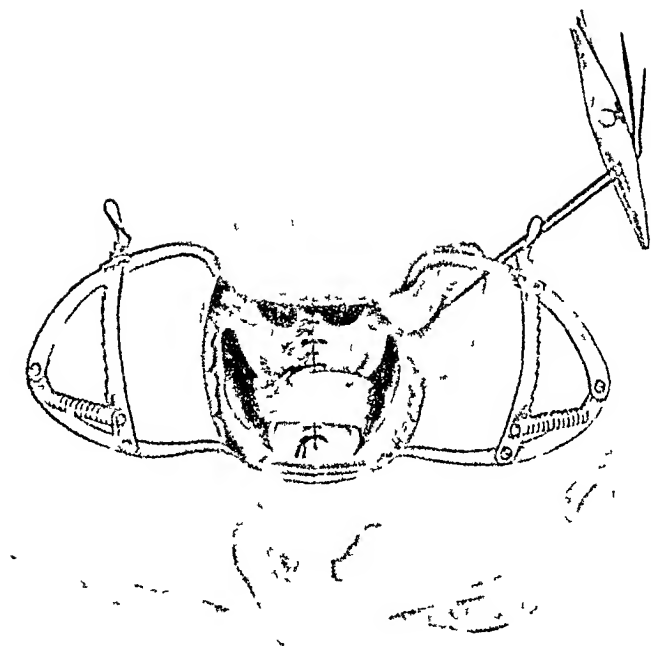


FIG. 7 — The tape has been passed through the lateral incisions around both flaps — the ends, fastened with a silk ligature and cut short, have been slid around to the nasal surface of the flaps

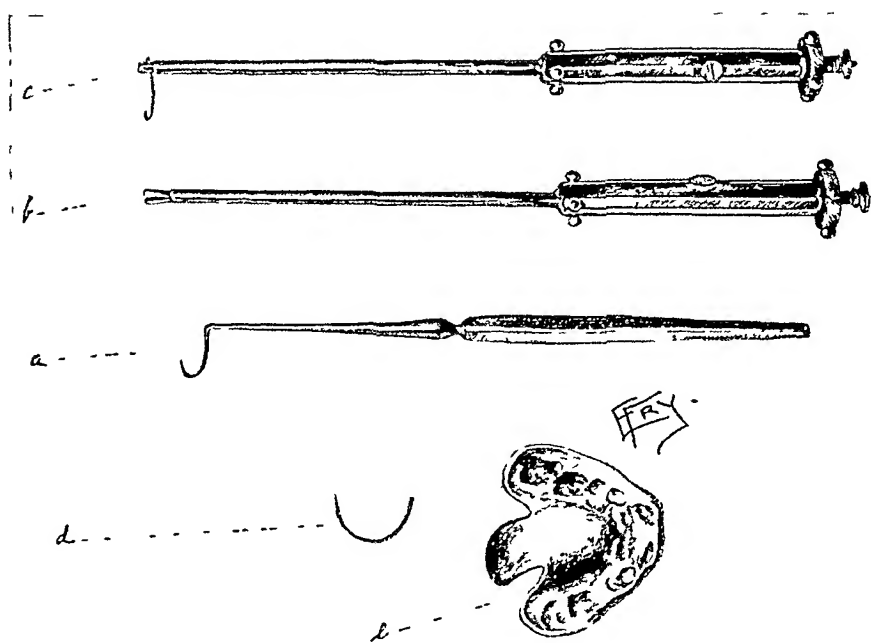


FIG 8—*a* right angled, half circle curved, Deschamp's handle needle with Hagedorn point *b* author's special needle holder, open *c* Author's special needle holder with needle in place it is held very firmly *d* special needle with eye in point made very fine half circle curved surgeon's point *e* Protective dental plate made by Dr. Fracchi for Case VI fits over upper teeth and gums and is held by suction tail piece to protect soft palate and uvula

so frequently occur at the junction of the hard and soft palate will heal by granulation in two or three weeks, persistent ones or defects in the uvula are closed by secondary suture

CASE I—Male, nineteen years of age, lumberman Operated upon at Roosevelt Hospital, service of Dr R F Weir, February 16, 1904, for complete cleft of soft and hard palate extending forward to incisor teeth Cleft wide, arch high, no previous operation, right unilateral harelip Palate operated upon in the usual way, lateral incisions packed with sterile gauze, no protective plate used

Plastic on harelip performed at same sitting, time of operation two hours, intermittent ether anaesthesia used Healing complete by primary union except for a small defect at junction of hard and soft palates which closed by granulation in a few weeks Left hospital on March 1, 1904 Examined May 1, 1904 defect above mentioned entirely closed but another very small opening had appeared at anterior extremity of cleft Improvement in speech very slight Case not seen since May 1, 1904

CASE II—Male, ten years of age, schoolboy Operated upon at Roosevelt Hospital, service of Dr R F Weir, April 9, 1904, for complete cleft of soft and about two-thirds of hard palate Usual operation performed, time of operation sixty-five minutes

Complete healing by primary union with no defects, stitches removed on ninth day, no protective plate used Left hospital April 20, 1904

Examined October 18, 1905, no defects, soft palate moves freely, improvement in speech only fair

CASE III—Male, four years of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, July 19, 1904, for complete cleft of soft and about two-thirds of hard palate Usual operation performed, time of operation 60 minutes, no protective plate used About the third day after operation child put finger in mouth and broke suture line in anterior portion of hard palate Another small defect occurred at junction of hard and soft palates, the remainder of the suture line healing by first intention

An attempt was made to close defects by secondary suture on July 31, 1904, with only partial success, but at time of dis-

charge from hospital, August 2, 1904, both defects were very small

Patient had not begun to talk prior to operation he was examined October 18, 1905, he is learning to talk and makes himself easily understood, his parents say, and pronounces many words very well indeed

CASE IV—Male, twenty-one years of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, July 27, 1904, for very wide, complete cleft of hard and soft palates, extending forward through alveolar process Harelip had been successfully closed in infancy The usual operation was performed, no attempt being made to close the extreme anterior end of defect on account of danger to nutrition of flaps Complete healing by primary union except for a small defect at junction of hard and soft palates which closed by granulation in about four weeks Left hospital on August 2, 1904, but reported at intervals for several weeks, he failed to return for operation to complete closure of anterior portion of cleft When last seen improvement in speech was not very marked

CASE V—Female, six years of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, March 29, 1905, for complete cleft of soft palate extending about three-fourths inch into hard palate A large adenoid was removed from the nasopharynx, and the usual operation for cleft palate performed, total time of operation 45 minutes Healing complete by primary union except uvula, which separated and was closed by secondary suture May 31, 1905, healing promptly No protective plate used

Examined October 18, 1905, palate perfect except that uvula is diminutive, improvement in speech very marked, pronounces many words perfectly, defect in enunciation seeming hardly more than a lisp

CASE VI—Male, seven years of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, May 13, 1905, for complete cleft of soft palate extending forward into hard palate about three-fourths inch Operation performed three weeks ago by another surgeon resulted in complete failure of union The usual operation performed, time of operation sixty-five minutes Protective plate made by Dr Fiaschi used in after-treatment, complete healing by primary union with no defects, stitches removed on the ninth day Left hospital able

to insert and remove plate himself for cleansing, without touching suture line Examined October 18, 1905, palate perfect except that uvula, as in Case V, was small, owing partly to the fact that in each the uvula was operated upon a second time Improvement in speech only fair

CASE VII—Male, seven years of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, September 22, 1905, for wide cleft of soft palate extending forward to middle of hard palate Adenoids were operated upon nine days before The usual operation performed, time of operation fifty-eight minutes The tape around the flaps was used instead of packing in the lateral incisions, the Fiaschi protective plate was used in the after-treatment Complete healing by primary union with no defects, stitches removed on the ninth day Left hospital seven days after operation because he developed chicken-pox

Improvement in speech is slight as yet

CASE VIII—Female, two years five months of age Operated upon at Roosevelt Hospital, service of Dr G E Brewer, October 12, 1905, for complete cleft of soft and hard palate, extending forward through the alveolar process Harelip had been closed in early infancy The usual operation performed, no attempt being made to close the extreme anterior end of the cleft on account of danger to the nutrition of the flaps Time of operation fifty-five minutes Tape around flaps instead of packing, no protective plate used as child was too young Healing of the greater portion of the suture line, the uvula and one stitch in front giving way Secondary operation will be performed in a few weeks

The child has not learned to talk as yet, and should prove a good subject in which to study the effect of the operation performed at this early age A sharp bronchitis complicated the first few days of convalescence

Summary—Of the eight cases, three healed primarily with no defects (Cases II, VI, and VII), one after a secondary suture of the uvula (Case V), one is completely healed except for a small anterior defect purposely left to preserve nutrition of flaps (Case IV), two have very slight defects barely admitting a probe (Cases I and III), and one, the most recent, has a defect of the uvula and also an anterior defect purposely left, both of which I hope to close by secondary operation within a few weeks (Case VIII) All of the defects mentioned in Cases I, III, IV and VIII could be easily

closed by secondary operation if it were possible to follow the cases and get them to consent to such procedure, as I hope to do in Cases IV and VIII

The time spent in the hospital after operation in Cases I to VIII respectively, was 19, 11, 14, 6, 30, 7, 13, and 13 days. None of the cases suffered to any extent from shock or hemorrhage, two had rather sharp bronchitis following the operation, which soon subsided, all were fed by mouth after the first 24 hours. Intermittent ether anæsthesia, with an open, sterile cone was used in all the cases, the time of operation varied from forty-five minutes to two hours, usually fifty-five to sixty-five minutes, a considerable portion of this time being consumed in arresting hemorrhage and renewing anæsthesia. The only suture material employed has been fine iron-dyed silk, No 6 and No 3.

Conclusions — The operation as described is essentially the operation of Langenbeck, and is capable of closing the cleft, if properly carried out, in nearly if not quite all cases of cleft palate, either in children or adults.

The easiest age to operate is from six to ten years, the best age probably from two to three years if it can be demonstrated that the danger is not too great.

The Rose position and the use of the Whitehead gag add greatly to the ease of exposure and control of hemorrhage.

The bellies of levator and tensor palati with their insertions into the palatine aponeurosis, should be preserved, but the attachment of the aponeurosis to the posterior margin of hard palate must be divided, together with the mucous membrane on the nasal aspect of the velum.

Complete relief of tension is essential, and division of the salpingo-palatine fold of mucous membrane is important to secure this.

Suturing should be as carefully done as in any fine plastic operation, and with needles that are sufficiently delicate to avoid injury to the edges of the flaps.

The after-treatment should be simple, no cleansing should be attempted on the palate or in the nasal fossæ, feeding by mouth should be commenced at the end of twenty-four hours. The use of the protective plate is of great value in older children and adults.

ACUTE ŒDEMA OF THE LUNGS SECONDARY TO ETHER NARCOSIS

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THE subject of acute conditions of the respiratory and of the circulatory system during and after anæsthesia of any form is of great importance. The possibility of primary cardiac failure under chloroform is well established as one immediate danger of this anæsthetic. The sequelæ of ether are more likely to be of the secondary type, and to localize in the lungs, usually as lobular pneumonia and infrequently as lobar pneumonia, or in the kidneys, as the various forms of congestion and inflammation. Acute œdema of the lungs is one of the immediate sequelæ of ether narcosis, which, while undoubtedly comparatively rare, must fully be reckoned with.

The following case of it will be of considerable interest on account of the rapidity of its onset, of its long continuation, and of the total recovery of the patient without any after-effects whatever. The case likewise illustrates the extreme importance of examination of the chest in any case of cyanosis, which does not improve when the ordinary precautions and means of restoration of freedom of the upper air-passages have been taken, such as pushing the jaw and pulling the tongue forward and exploring the upper air-passages with the finger. It is in every probability certain that, if the chest of this patient had not been examined instantly with the ear, the œdema would not have been discovered sufficiently early to have rendered medical aid of service.

The incident occurred in the practice of Dr Charles H Chetwood, with whose permission and knowledge these notes are published, and whose favor and courtesy therein are hereby acknowledged.

Very full details of the case are given, because absence

of many factors in the cases reported in literature makes some of their notices rather unsatisfactory, as the second part of this paper will indicate

For convenience of reference in the summary with which this paper closes, this case is called Case XV

History and Examination previous to inducing Anæsthesia — May 24, 1903, M H, male, white, about thirty years old, American Jew, merchant, no previous operation under general anæsthetics, addicted to the moderate use of alcohol, such as the member of a wealthy family would employ socially, about five feet seven inches tall, weighs 120 pounds, of reasonable muscular development, of fair nutrition, although somewhat anæmic, of pale to sallow complexion, hair very dark, and general health good, of rather neurotic temperament, showed considerable fear prior to the operation, although able to enter the operating-room, and, unaided, to get upon the operating table Examination of his heart and lungs by *cursor* auscultation over the front and sides of the chest revealed nothing abnormal The back of the chest was not examined The heart-beat was about 100 and quite normal in character The arteries and veins were without feature, and the nose and throat had not been giving symptoms No cough was present Both stomach and rectum were empty The ante-operative urine was normal No visceral lesions were known to the operator The pathologic condition was internal and external piles The patient received no drugs prior to administration of the anæsthetic, which was the nitrous oxide gas and ether sequence with the Bennett inhaler The posture was dorsal until the anæsthesia was complete, when the lithotomy position was used

Induction of Anæsthesia — About one gallon of gas was employed, that is, the ordinary gas-bag of the Bennett inhaler was filled to distention Under this anæsthetic the patient became somewhat blue and did not show a full degree of its effect, as was proved by the fact that he underwent considerable ether excitement prior to finally getting under This excitement was so great that restraint was necessary to prevent the patient from writhing off the table The writer rarely has seen, except in hospital practice among alcoholics, an individual show as much

ether excitement as this man did. After the conjunctival reflex had been abolished, and after the pupils had dilated somewhat, although still reacting to light, the man showed great rigidity of the extensors of the extremities, especially at the knees and elbows. In the effort to overcome this rather obstinate muscular reaction, the anæsthetic was pushed rather hard and fast, and succeeded finally in eliminating the trouble after probably ten minutes' delay, which shows that no undue haste was present. The operation was begun at this stage.

Maintenance of and Condition during Anæsthesia—The patient, however, did not stay thoroughly under the anæsthetic, in that he showed muscular movements during the operation, insufficiently, however, to interfere with the operator. His color throughout the operation was satisfactory, the pupils were moderately dilated but reacted to light, his pulse was steady at about 90 and his respiration showed the usual ether acceleration. There was throughout the anæsthetization hardly any mucus in the mouth or throat and no audible bronchorrhœa. The operation itself lasted about twenty minutes, and the man was inhaling the anæsthetics about thirty minutes.

The total amount of ether used in the cone was probably four ounces. Unfortunately, the upsetting of the ether-bottle during the stage of excitement made it impossible to measure accurately the amount, but four ounces would be a maximum and three and one-half ounces a minimum estimate. The anæsthetic was withdrawn during the dressing of the patient, and when the dorsal position was resumed, the writer noticed that the man began to get cyanotic, and that his respiration seemed to hesitate, as though he were about to vomit. He was then moved to bed and carefully protected against exposure by being covered, although the day was a rather balmy day (May 24, 1903). The writer stayed with him, noting that he did not vomit and that the cyanosis increased. It was evident that something vital was wrong, and the operator was immediately summoned. By this time (about ten minutes after his return to bed) the man's color was a livid blue and his respirations were beginning to lose their force, although the rate had not materially changed. The writer pushed his finger gently down the patient's throat in order to ascertain whether by some inadvertency he had regurgitated and

then inspired a bolus of food, though this seemed highly improbable, because it had been noticed that he had made no œsophageal movements. The writer passed his finger over the epiglottis and into the cavity of the larynx, and as far as he could reach nothing foreign was encountered. He then put his ear to the patient's chest and to his amazement found a very active universal acute œdema of the lungs in progress. The pulse at this moment was of good quality, about 120 beats to the minute, and the pupils were small and slightly active to light. The patient was given a hypodermatic injection of atropine sulphate, a twenty-fifth grain, and the foot of the bed was slightly elevated to an angle of perhaps fifteen degrees with the floor. Dr Chetwood then instituted very active dry-cupping with wine-glasses over every part of the chest without turning the patient over. At this moment the patient's heart began to fail, and he was given strychnine sulphate, a twentieth grain, through the needle. With great caution the patient was now rolled upon his right side, and while the writer continued on duty at the head holding the tongue and jaw well forward and, while Dr E. L. Keyes, Jr., kept the bedclothes from pressing on his abdomen, which up to this moment almost alone had been carrying on the respiratory function, Dr Chetwood continued the cupping all over the back of the chest. Artificial respiration was not employed at this or any other period of the resuscitation. For the next few minutes, while the cupping was continued, the patient's condition remained unaltered, and then the heart began to show signs of weakness again, he was given two syringefuls of whiskey and another injection of strychnine, bringing its total up to a tenth grain. Auscultation of the chest at this moment showed that the râles were beginning to disappear, although the color was still anything but satisfactory and the pulse was still weak. Auscultation of the heart showed pure muscular tones, so that Dr Chetwood and the writer remarked that hope of his recovery was appearing. Oxygen arrived about this time, and was administered in the usual manner as rapidly as the patient could possibly use it. His color now began to improve slowly, but his pulse was still unsatisfactory. He accordingly received nitroglycerin, a twenty-fifth grain, hypodermatically, from Dr Keyes. This was at the end of about forty minutes of work upon the patient. In a few

moments the great value of this injection appeared and the pulse became much stronger and bounding. When this condition was apparent, the foot of the bed was raised to an angle of forty degrees with the floor. These two details of treatment, the large dose of nitroglycerin and the increase in the inversion of the body, appeared to have accomplished, next after the cupping, more than any other one element of treatment. From that moment on the patient's condition became promising, but the responsibilities of the issue were great enough to warrant a consultation, and accordingly Dr Walter B James was called. His physical examination confirmed our findings, viz, that the râles had disappeared from the entire chest with the exception here and there of an occasional "click." He also agreed that the heart, all things considered, had returned to practically its normal condition, but recommended, as a general cardiac support and as a final precaution, that five minims of the tincture of digitalis be administered. This medication was the last the man received. Dr James also concurred in our prognosis that the patient would recover, and believed that no late lung complications would appear. A few moments after Dr James's withdrawal the case was left in the writer's hands, and he used the following course of treatment during the next hour and a half. The respiration steadily gained in force and decreased in frequency, until after about one hour the cyanosis of the face, mucous membranes, and finger-nails, which were carefully compared with those of bystanders as standards, had disappeared. Every ten minutes the front and sides of the chest were auscultated, and every twenty minutes the patient was rolled upon his side and the back of the chest was auscultated. At none of these examinations were there râles, but a click (without dulness) was present at inspiration only in the left infraclavicular region, which had totally disappeared by the time Dr E L Keyes, Jr, assumed charge of the case early in the evening. The pulse was at this time steady and regular at about 80 to 90 beats to the minute, of good force and quality, and the heart sounds were firm and muscular. The capillary circulation was efficient wherever and whenever tested by pressure over a bony prominence, to squeeze out the blood and observe its return, for instance, at the finger-nails. The pupils at this stage were moderately dilated and very reactive to light.

The action of the pupil was throughout the case very interesting. At no time was reaction to light totally abolished, and only for brief intervals was the pupil widely dilated, notwithstanding the fact that the patient had received rather a large dose of atropine. The effect of this drug on his respiration and circulation was admitted, but for some unknown reason the pupil showed scarcely any effect whatever. All the drugs administered were from the author's hypodermatic set, always carried for emergencies in solution. It is possible that the atropine had lost its activity on the pupil. This is not likely, because the chemist of the New York Hospital states that solutions of atropine there have not been known to deteriorate, although kept in stock indefinitely in the same kind of rubber-capped half-ounce bottles as the writer always carries. No morphine was at any time administered. Oxygen was inspired by the patient constantly from the time of its delivery at the house up to about one hour after the writer was left alone with him. It was suspended when no further improvement of the color continued, and when his parents admitted that his visage was, as far as they could see, perfectly normal.

Conjunctival reflex was present in a moderate and sluggish degree just before Dr Chetwood and Dr Keyes, Jr, left, and in an active degree about a half hour later. No vomiting whatever occurred until some time after the cyanosis was absent, when, without warning, the patient, with a loud, shouting phonation, vomited up a few drachms of mucus, and then answered slowly when called by his mother, and looked in a dazed fashion at the writer when he likewise addressed him. About a half hour after this the patient repeated the vomiting and was able to ask why he had a sore chest.

One extremely interesting feature throughout the convalescence, which was noticed by all present, was that there was at no time any perceptible mucus in the trachea, larynx, or mouth. This was true during the initiation and maintenance of the anaesthesia and the convalescence. Although the patient vomited a little mucus, he coughed up absolutely none. The whole disease process appeared to have found its origin in the air-vesicles, to have reached its acme there, to have run its course there, and to have ended there.

The behavior of the heart was most instructive, because, while the œdema was developing, its action was, broadly speaking, normal, although accelerated, and only after the œdema was so fully established, that the respiratory function had begun to fail, were unfavorable signs from the heart noticed. It seemed probable, therefore, that the œdema was primary in the lungs and not in the right heart.

It matters not which of these two conflicting views be correct—whether the œdema had been primary in the lungs, and only when of sufficient degree to interfere with the circulation had caused cardiac obstruction, and then incipient cardiac failure, or whether the ether had had, as it occasionally does, a selectively depressing action upon the right heart, and after having excited this phenomenon primarily, had set up œdema in the lungs secondarily.

The case is positively the most interesting in the writer's experience in anæsthesia work, and he believes it to be one that is not without clinical importance. There are very few cases of acute œdema of the lungs secondary to ether narcosis reported in literature. F. W. Hewitt (called Case XVI in the closing table of this paper), in his admirable work on "Anæsthetics and their Administration," alludes to a fatal pulmonary œdema in a patient who was the victim of paralysis of the diaphragm, which no doubt in itself was an important causative factor. In the patient under discussion, however, the diaphragmatic respiration was practically the only one at work during the acme of the trouble, so that a parallel between these two subjects cannot be appropriately drawn.

The only other case of œdema of the lungs under anæsthesia, which the author has himself seen, was at the Sloane Maternity Hospital. The subject was a negress, about thirty years old, suffering from eclampsia. *Chloroform* was being administered by him drop by drop with the utmost precision and caution, when prior to circulatory difficulty the œdema began. This patient was saved in exactly the same manner as the writer's male subject, namely, by active dry cupping over the whole chest, first on the front and sides and then, after

these had improved, on the back Veratrum viride was employed to dilate the arteries and quiet the circulatory excitement, which was very marked. No parallel may be drawn between this case and that which has been described, because the eclampsia itself may have been partially or totally the cause of the trouble, and the anæsthesia a mere incident moreover, ether was not employed at all.

DEDUCTIONS

The lesson which is to be drawn from this case, which might quite well have been a fatality, is that ether even when given carefully may occasionally cause pronounced and dangerous irritation of the air-vesicles. The man probably received somewhat less than four ounces in from thirty to thirty-five minutes of administration, but the operation was rectal, and resistance to ether was present in his nervous system throughout that time. Consequently, the writer is of the opinion that the œdema was not due to an excessive amount of ether. The œdema may, however, have been induced by the circumstance that when rigidity appeared in the extensor muscles traditions of training and observation were followed in pushing the ether rather rapidly to overcome this complication. It is conceivable that the irritation of the lungs began with this *concentrated* dose of the anæsthetic, although in actual amount it should not be considered proportionately excessive, and although at the moment no unfavorable reaction on the part of the patient was observed, and ten minutes (a proper delay) elapsed before the operation began.

Since this case occurred, the writer has followed the practice in his own work and in the teaching of those he has had the pleasure to meet as instructor, that when any such resistance to the anæsthetic occurs, it is best to wait patiently for it to disappear under a steady and gradually increasing exhibition of the anæsthetic. In this way he does not like to have an operation begin on such a subject much short of ten minutes after the beginning of the inhalation of the drug, whereas under

the former procedure the work usually began in less than half this time. He has been rewarded by finding that cases which promised to be troublesome by some such incident at the beginning have followed an anæsthesia with much less difficulty, or none throughout. The principle at stake is that of teaching a boy to swim. If we throw him off the dock into deep water his danger of drowning is extreme, whereas, if we lead him gradually, he may by instinct take care of himself by swimming in water sufficient for that purpose and yet not really beyond his depth.

Another lesson which the writer draws from this case is that of listening to chests after ether narcosis, whether the patient does well or not under it. He has been astonished to find the great number of subjects who show râles in the chest here and there, even when the bronchorrhœa has been immaterial or absent. When the bronchorrhœa is extreme, the noise transmitted down the bronchi is so great that the distinction between the transferred sounds and sounds within the air-vesicles may scarcely be made.

The cases to which attention is drawn, however, are just the opposite of these, namely, where, with a clear throat and free trachea, bubbling sounds are present here and there over the thorax. Putting these two facts together, as the basis of present practice, the writer now takes time, and if necessary plenty of it, to get the patient thoroughly under the ether slowly before he is transferred to the operating table. In the case reported, ten minutes' delay in this process was made, doubtless much longer time would have been better.

In connection with the subject of râles after ether narcosis, the writer has been informed that at the Royal Victoria Hospital in Montreal all subjects of etherization are during convalescence from narcosis protected with a pneumonia jacket a most wise precaution, simply taken.

A third lesson indicated by the case is that elevation of the foot of the bed has a very great beneficial influence on these patients. Many hold that more harm than good is done to a failing heart by this procedure. With this view the writer dis-

agrees, and believes that the procedure of first elevating the bed slightly and then fully, contributed very materially to the recovery of this patient. In fact, when the second elevation was done, Dr E L Keyes, Jr, remarked that it appeared to have benefited the clinical conditions better than anything else tried. The writer thinks that when difficulties after operations arise, one should consider what the condition of the blood within the patient is, namely, that the great veins of the abdomen, which are capable of holding all the blood of the body, are at the moment, in fact, thus distended, either through the failing heart or the shock of the patient. Against this inert accumulation the heart must work while the arteries themselves contain too little blood to constitute the normal bulk of fluid for propulsion. It is therefore rational to believe and to practise that an elevation of the foot of the bed just sufficient to make the blood flow out of the veins into the heart slowly, to be sure, and under low pressure, so that the intermittent heart action may accommodate it, is exactly the kind of aid which the heart needs to supply it with the blood required to combat this disadvantage of failure, whether from shock or from paresis of its own muscle.

The writer believes, therefore, that this middle view between extreme elevation, which might engorge and stop the heart, and no elevation, which might embarrass it through lack of blood to pump through the arteries, is the correct and rational procedure. He considers the other dictum wrong in refusing to elevate the bed at all, but right in stating that it should not be elevated to the extreme.

Hewitt says in his book "It is a popular fallacy to imagine that because heart sounds are normal and no visceral disease can be detected, the anaesthesia will run a perfectly normal and straightforward course." This statement agrees perfectly with the writer's experience, which is now considerable, and only reinforces the statement with which he would close this section of the paper, namely, that it is proper to allow the anaesthetist plenty of time to find the pace of his subject in order to run the race of the operation evenly with him. For the

purposes of comparison and for the sake of completeness, it has seemed well to include in this discussion similar cases reported in literature. For the following list of cases the writer is indebted in large part to Dr Edward W Preble of this city, who very kindly and faithfully looked up the matter.

CASE I—MORTON (*American Journal of the Medical Sciences*, vol lxxii, New Series, 1876, page 411) Patient aged nineteen years, male, no history of winter cough or previous chest trouble, general health not vigorous, but not markedly impaired by spinal (probably spondylitis) and knee lesions, no evidence of hereditary disease, operation for ankylosis of the knee, June 3, 1876, narcosis lasted twenty minutes, $2\frac{1}{2}$ to 3 ounces of ether used poured upon a towel, no inhaler as such employed. At the close of the operation, pallor and depression, with the usual postoperative degree of comfort, present, fifteen minutes after operation, and during consciousness, asphyxia developed, most marked in the face and finger-tips, pulse moderately full, about 160, respiration nearly ceased, tongue depressed, and cold water dashed upon the chest, only violent respiratory movements followed, a half-hour later the heart still acting, though labored, and throat filled with bloody mucus, evidences of pulmonary engorgement present, radial artery opened, 8 ounces of blood withdrawn and dry cups applied to the chest, for a time respiration improved, and volume of pulse increased somewhat and fell from 160 to 152, hypodermatic injections of whiskey and carbonate of ammonium failed to revive him from a sinking spell, during which he died after about another hour, that is, about two hours after the operation. The autopsy showed pleuritic effusion, old "infiltrating" pleuritic adhesions scattered everywhere, most marked at right base, œdema of the lungs, deformity of chest, lumbar kyphosis, displacement of abdominal viscera, and fluid in the pericardium. (No note as to renal or encephalic conditions.)

CASE II—SAUNDBY (*British Medical Journal*, October 13, 1877) Patient aged thirty-five years, female, October 4, 1877, operation for ankylosis of the knee, "about an ounce" of ether, Ormsby inhaler, narcosis normal throughout, recovery from the anæsthesia, one and a half hours later developed cyanosis, failure of the pulse, râles over both lungs. The patient was well wrapped up and carried directly from the operating theatre across an open court to a detached building of the hospital, fifty yards away. Was conscious upon reaching the ward, and spoke to the nurse, who noted nothing unusual in the patient's condition. This procedure of carrying the patient across the court-yard was contrary to the rules of the hospital, and happened in the absence of the house-surgeon. Saundby adds that he cannot state whether or not this exposure had anything to do with the œdema. The autopsy showed effusion into the arachnoid, œdema of the lungs, but otherwise negative.

In the opinion of the author, exposure during the operation at any time, excepting as absolutely necessary and during convalescence from the anæsthetic, in any way, is extremely hazardous. His practice is to direct that the patient be kept covered most carefully and completely, excepting the face for breathing, until complete consciousness is restored, so that the patient may direct the attendants himself as to his feelings of chilliness or warmth. Protection against draughts and changes in temperature is also of extreme importance. All patients perspire slightly, and most patients very freely during the later stages of narcosis and during recovery. Any exposure which tends to check this activity of the skin must be very dangerous to both the lungs and the kidneys. It is probably proper to observe that the exposure noted by Saundby was undoubtedly a very important feature in the case. This opinion is borne out by one experience which the writer has had in the only fatal pneumonia he has had among his anæsthesia patients, which occurred as follows. A perfectly healthy, middle-aged man was under ether fifty minutes for a difficult herniotomy, and consumed two and three-fourths ounces of ether (measured) through the Bennett inhaler, with the upper air-valve open, without any unfavorable symptoms whatever, excepting very free perspiration. The writer was excused by the surgeon to go to another case, and therefore did not see the patient put to bed and could not carry out his usual precautions of protection, as just stated. The surgeon later admitted not only that they were not carried out, but also that a window at the head of the bed and a door at the foot of the bed were left open by the nurse, apparently on the supposition that the hot air of August would do no harm. Congestion of the lungs at once developed, and after three or four days double pneumonia appeared, lobar in type, most severe on the right side, which was the nearer to the open window. The opinion of the medical consultant is quoted in saying that the ether itself had nothing to do with the case, because the pneumonia was lobar in type, and developed so long after the narcosis

The exposure, in his opinion, on top of the perspiration spoken of, probably was the exciting factor

It is well to call attention again to the pneumonia jacket used in some hospitals during recovery from ether narcosis

CASE III—PARSONS (*Medical News*, March 18, 1882, page 295) Female, aged fifty-four years, normal heart and lungs, reduction of old dislocation of the shoulder, February 16, 1882, narcosis lasted twenty-five minutes, 6 ounces of ether inhaled (method of administration not stated) Recovered from the anæsthesia within five minutes, in one and one-quarter hours cyanosis developed, with death following upon a high degree of pulmonary congestion Five minutes after the reduction the patient asked for a drink of water, and a little later wished to go home After attending to a few remaining patients, the doctor left her in charge of a friend and the janitor, after about a half hour she was again seen by the anæsthetist, and an hour later the house-physician was notified that she was dying, he then found her in a cyanosed condition Two hypodermatic injections of ether were given, 20 minims each, and three or four injections of brandy Twelve or fifteen dry cups were applied over the chest and other stimulating remedies resorted to, death occurred about one hour after The autopsy showed heart, liver, and one kidney normal, the other kidney was slightly fatty The lungs were deeply "congested," thus causing her death

In the opinion of the writer, the following comment may be offered This operation was performed in New York City during February If the janitor and friend referred to were at the patient's house (the original article is by no means definite on this point), the patient was allowed to go home a very short time after recovery from the anæsthetic This exposure must have been, as in Saundby's case, a very important, exciting feature in the issue of pulmonary congestion, coupled, of course, with the basis laid for the lesion by the ether itself

CASE IV—HUTCHINSON (*Lancet*, 1885 vol 1, page 178) Male, aged sixty-two years, January 14, 1885, for reduction of old shoulder dislocation, carried out in the Out-Patient Department of the London Hospital in the winter-time Ormsby inhaler used, air-cap slightly open, induction of anæsthesia within the usual time The reduction of the dislocation was not satisfactory, so that the anæsthesia was resumed for a short time with whatever ether was in the inhaler The patient now began to look pale and to breathe very feebly, brandy hypodermatically was administered over the heart The tongue was drawn out and artificial respiration was begun Electricity was used to the nerves of the neck, dusky of the skin increased and efforts at artificial respiration

failed of result, although continued for a half hour Upon the removal of the inhaler the second time, there was at first no anxiety, there had been struggling during the first administration, but none during the second No food had been taken, and no lung trouble was admitted by the patient, although he was evidently short of breath The autopsy showed emphysema of the lungs, congestion, bronchitis, and mucus in the bronchi, the lower lobes did not contain much air, and there was more œdema in the upper parts The trachea was congested and contained frothy mucus, the heart was fatty, the pericardium was adherent, the other organs were healthy The pathologist thought death was due to fatty heart and emphysema The patient had not been well for some time before, and had fainted not long before applying at the hospital

This operation also seems to have taken place in the winter-time It is possible that the exposure, unavoidable in an Out-Patient Department, may also have been a cause of the œdema

CASE V—JACOB (*British Medical Journal*, 1885, page 887), in a table of deaths under anæsthetics, notes the following Female, aged sixty-four years, ovariectomy, death seventeen hours after operation with symptoms of pulmonary œdema, no autopsy

CASE VI—E GURLT (*Archiv für klinische Chirurgie*, Band xlviii, page 273), quoting Trendelenburg Female, aged thirty-five years, cholecystenterostomy, narcosis one and a half hours, normal but with appreciable salivation and repeated vomiting (method of administration omitted), upon coming out of the ether loud mucous râles were heard in the trachea and bronchi over both sides, the symptoms grew worse, death occurred thirty-two hours after narcosis, apparently of œdema of the lungs On the next day after the operation the condition was difficult in expectoration on account of the abdominal wound Trendelenburg adds that it is doubtful whether the ether caused the death, the patient had carcinomatous lymph-nodes in the abdomen, perhaps secondary to a tumor of the pancreas She may have suffered from pulmonary metastases No autopsy was allowed

CASE VII—GRANT MORRIS (Proceedings of the Society of Anæsthetists, *Lancet*, May 7, 1898) reported as follows Female, thirty years old, pain in the region of the left kidney, cachexia, trace of albuminuria on admission, but none on the day of operation, exploratory laparotomy, ether from Clover's inhaler, not pushed, taken normally, slight cyanosis, much frothing at the mouth towards the end of the operation No alarm occasioned Patient taken from the table after sixty-five minutes still cyanosed, respiration unimpeded but shallow and sighing, appeared about to vomit, no evidence of obstruction to breathing, conjunctival reflex present, pupils equal and contracted In fifteen minutes became ashy pale, first the respiration and then the pulse ceased, artificial respiration brought away much frothy, watery secretion The autopsy showed lungs full of frothy secretion Death due apparently to failure of respiration from acute œdema of the lungs set up by the ether There was no hemorrhage into the medulla

CASE VIII—In the discussion at this meeting, SHUK said he had witnessed a similar case, much ether had been inhaled, the lungs were water-logged from acute oedema. He stated that in his opinion artificial respiration is dangerous in these cases.

CASE IX—At the same meeting, DR STANNING thought that renal diseases might be a factor in producing acute oedema of the lungs, and instanced a case supporting this view.

CASE X—POPPIER (*Deutsche medizinische Wochenschrift*, 1884, 37, pages 719 to 722) Male, forty-six years old, farm-hand, previous good health, no cough, long-standing alcoholic habit moderate in degree for one and a half years previous to admission. Admitted May 20, right inguinal hernia in the early stages of irreducibility and inflammation, medicinal treatment until May 31. Ether narcosis—radical operation for irreducible inguinal hernia, small abscess in the sac and recent adhesions, no perforations, wound picked, no bowel reduced into the abdomen. Narcosis lasted thirty minutes, 130 cubic centimetres of ether used, Czerny's, then Juillard's mask employed, anaesthesia slight, sub-conscious movement, slow, strong pulse, slight cyanosis, regular respiration; one emesis of gastric mucus, mucus rales toward the close of narcosis, prompt recovery of consciousness, no immediate complications, after more than an hour increasing dyspnoea with loud râles, frequent cough, and much mucous sputum appeared. The pulse was so strong that no stimulants were needed, and the diagnosis was rendered of unusual accumulations of mucus, which the patient, being fully conscious, was expected to cough up for himself. (There is no note of any physical examination of the chest.) Rapid heart failure with progressive cyanosis, accompanied by large quantities of blood-stained mucus in the nose, mouth, and throat, appeared, and death supervened during manifest oedema of the lungs.

The autopsy was held on the day of death and showed generalized peritonitis with recent adhesions, two intra-abdominal abscesses, hernial canal admitted several fingers. Contents of sac adherent, normal heart, slight aortic sclerosis, lungs slightly emphysematous, very markedly oedematous, the trachea and bronchi were filled with blood-stained, watery mucus. The other organs were normal. The cause of death was assigned as acute oedema of the lungs.

No note is given of treatment directed against the oedema of the lungs, hence no one may say whether or not it was suspected until its discovery was too late to be of value to the patient.

CASE XI—RIEDER, quoted by E Gurlt (*Archiv f. klin. Chir.*, LVIII, page 264) Male, forty-four years old, admitted November 11, 1893, previously healthy, excepting abdominal pains progressing steadily and not relieved by lavage, no jaundice, powerful, well-nourished man, normal temperature, normal urine, emphysema, normal heart, tenderness over gall-bladder. Operation, November 12, 1893, exploratory laparotomy under morphine and ether (quantity and inhaler not stated), narcosis forty-five minutes long, with great cyanosis, recovery prompt, with

mental disturbance, pulse 80, regular, full, strong, rather feeble respiration

November 13, about the same general condition, excepting increased mental disturbance, no vomiting, no abdominal pain, spontaneous urination, in the afternoon, pulse 96, weaker than before, but still rather strong, food refused, death thirty-three hours after operation. Autopsy on November 14 showed emphysema, œdema, early infiltration on the surfaces of the lungs, atheroma of aorta, shortening of one aortic valve, narrowing of coronary arteries, slightly fatty heart

Gurlt considers this case one in which œdema of the lungs was important. No note is given of the manner in which the ether was given, and none of measures adopted to combat the œdema. The latter fact, and the absence of statement of signs of the œdema during life, raise the question whether, after all, this condition was so etiologic as Gurlt in his table describes

CASE XII—J KAARSBERG (*Centralbl f Chir*, 1896, page 337), June 16, 1889, female, ovariectomy, anæsthesia forty-five minutes long, 150 cubic centimeters of ether (inhaler not stated), normal narcosis, cessation of respiration during dressing, easy artificial restoration but prompt recurrence of cessation after a few spontaneous respirations, for seven and one-half hours artificial respiration was continued, then death, pulse continued strong up to within an hour of death, when râles and cyanosis demanded venesection, no return to consciousness, autopsy showed œdema of lungs, fatty heart, senile atrophic kidneys (brain examination for lesions of the fourth ventricle not reported)

CASES XIII and XIV—ROSIING-HANSEN (quotation, *Centralbl f Chir*, 1896, page 338) reports two cases of fatal œdema of the lungs secondary to ether narcosis for placenta prævia. Great anemia was present in each instance, so that the author raises the question as to whether the anemia or the ether was the more potent factor, and concludes that the ether was the cause, because anemia cannot be regarded as having that relation to œdema of the lungs. No report is given of means adopted to treat the œdema

CASES XV and XVI are the author's patients with piles and eclampsia respectively, discussed previously

CONCLUSIONS

Mere tabulations of the important elements in monographs of this character very rarely have definite value. It is hoped, however, that the grouping into paragraphs of the rather essential details will be instructive and serve as a suitable termination of the paper

I The *quantity of ether* used in six cases in which this particular is stated averaged 4 ounces. The extremes were

1 ounce and 6 ounces In Case VIII "a large amount" was used No quantity is given in IV, V, VI, VII, IX, XI, XIII, and XIV The quantity of drug employed is, provided the limits of intoxication are not approached, of comparatively little moment The best measure of the amount of ether to be used is the patient himself as regards his symptoms and not a glass graduate Thus it is certainly possible to overwhelm a patient with a few ounces, which would scarcely affect a very similarly constituted individual The proper procedure is steadiness of increase of the concentration and deliberation in the presence of even slight difficulties Incautious haste (merely to save time which should properly be devoted to securing the patient's safety) and rapid concentration of fumes mark the course of danger

2 The *form of inhaler* was the bag-type (improperly called "closed" method, properly called "regulable" method, because the valves allow of perfect adjustment to the indications) in II, IV, VII, XV, no inhaler at all as such in I, and is not stated in III, V, VI, VIII, IX, XI, XII, XIII, XIV Czeiny's and Juillard's masks were used in X, whose precise nature cannot be determined through the New York dealers

The control of conditions by means of the valves and the warming of the ether fumes by means of the bag make the regulable or bag inhalers by all means the safest and best In the hands of the indifferent, however, undue concentration of fumes may be rapidly and intensely attained No one therefore should begin to employ these inhalers without careful study of their mechanism first, and, second, instruction from an expert It is possible by haste, carelessness, and inaptitude to render the position of a patient in any narcosis one of danger, no matter what inhaler is employed

3 *Recovery of consciousness or "from the ether"* is stated to have been complete in I, II, III, X, XI, XV, incomplete in VI, and is not noted at all in IV, V, VII, VIII, IX, XII, XIII, XIV It is possible to argue from the number of prompt restorations of consciousness that true intoxication with ether is not by any means an essential to the œdema, and

it is also fitting, therefore, to repeat that manner of administration and other circumstances in the management of the narcosis and convalescence are the etiologic factors

4 The *nature of the operation*, probably of no moment, excepting when the air passages themselves are being invaded, was reduction or other invasion of joints in I, II, III, IV, laparotomy in V, VI, VII, XI, XII, herniotomy in X, midwifery (pacentia prævia) in XIII, XIV, not stated in VIII and IX, piles in XVI. It is well to note that two (III and IV) of the joint cases were treated in out-patient departments, where exposure to cold is almost unavoidable, and one (II) was confessedly very greatly subjected to check of perspiration and change of temperature. It is thus worth while to repeat that too little attention to this protection is given by surgeons, assistants, nurses, and other attendants. Operations under ether in out-patient departments are probably very dangerous on account of the conditions of temperature and ventilation.

5 The *average duration of life after the operation* was eleven and three-fourths hours in seven cases, the extremes were one and one-third hours and thirty-three hours. Unsatisfactory or no statement on this point is given in IV, V, VIII, IX, XI, XIII, XIV.

6 *Age and sex* are, as in all narcosis, of little importance excepting as they are concerned in the diseases most common to the various periods of life and to the two sexes. The average of 12 stated ages of these patients was 41 years and the extremes were 19 and 64 years, the females numbered 7 and the males 5. Age and sex are not given in 4 reports.

7 *Previous good health* is stated to have existed in Cases X, XI, and XV, ill health in reports I, IV, VI, XIII and XIV, while notes on this point are wanting in histories II, III, V, VIII, IX, and XII. This detail does not take in autopsy findings.

8 The *forms of ill health, independently of post-mortem examinations*, are given as "not vigorous" in I, evident dyspnoea in IV, carcinomatous lymph-nodes secondary to cancer of the pancreas in VI, nephritis in VII (?), IX, anæmia sec-

ondary to hæmorrhage of placenta prævia in XIII and XIV, and piles in XV

The reporter of XIII and XIV thinks anæmia of little importance in these cases. The writer, however, while instructing the members of the house-staff at the Roosevelt and Polyclinic Hospitals never has seen an anæmiac do well if the ether or chloroform be carelessly handled. The depression of the anæmia multiplies susceptibility to all drugs, and thus that to the dangers of anæsthetics

9 The *autopsy findings* were as follows. Disease of the pericardium, heart, arteries, and valves, was in some form present in I, IV, X, XI, XII, disease of the pleura, lungs, trachea, and bronchi (other than œdema) was in some degree proved in I, IV, X, XI, disease of the kidneys of distinct form was established in III, XII, disease of the abdominal viscera, including hernia and peritonitis, but excluding the kidneys, was in some type present in I (displacement by deformity) and X. Lesions of the brain were found on autopsy in II, pronounced absent in VII, and were not sought, though possibly present, in XII

10 *Œdema of the lungs* was diagnosed as a distinct entity by physical examination and clinical signs in I, XV, II, III, V, VI, IX, X, XII, XIII, XIV, by autopsy in III, IV, VII, X, VIII (by inference), XI

Œdema of the lungs is regarded as the chief cause of death in II, III, VII, and may possibly have been such cause in I, IV, VIII, IX, X, XI, XII, XIII, XIV. Notes in V and VI are too fragmentary for classifying

Œdema of the lungs though present was not fatal in XV

11 No *treatment* is stated in II, V, VI, IX, XI, XIII, XIV. *Treatment of the œdema* was venesection in I and XII, dry cupping in I and XV, free cardiac and respiratory stimulation in I, III, IV, and XV, artificial respiration in IV, VII, XII, electricity to the nerves of the neck in IX, stimulation of pulse was omitted intentionally in IX, artificial respiration is regarded as dangerous in VIII, an opinion concurred in by the writer, because it serves only to pump the serum from the ves-

icles into the bronchioles and bronchi, where it simply clogs the main channels of the air current. Elevation of the foot of the bed moderately at first and then fully is stated to have been used only in XV. Stimulation of the pulse with arterial dilatation is stated to have been employed only in XV. Dilatation of the pulse with *veratrum viride* was carried out only in XVI, the case of eclampsia.

The deductions from these facts which may be drawn are that the best treatment of the œdema is active dry cupping, and of the circulation in asthenic cases is free use of nitroglycerin and strychnine, elevation of the foot of the bed moderately at first, later fully, and of the circulation in sthenic cases is venesection or judicious use of the aconite group.

The *best prophylactic measures* are certainly deliberate uniform administration and the most adequate possible protection of the patient from draughts and changes of temperature during the stage of perspiration in convalescence.

EXCISION OF PORTIONS OF THE CHEST WALL FOR MALIGNANT TUMORS ¹

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MALIGNANT growths of the chest wall as seen clinically are chiefly of two classes, carcinomata, secondary to primary tumors of the breast, or sarcomata (including endotheliomata) arising from the ribs, periosteum, skin, pleura, etc

In these days of radical operation for cancer of the breast, which is apt to be performed earlier than formerly, the prognosis is far better than it was a few years ago, but still a considerable proportion of cases exhibit regional recurrences in spite of most radical work. These occur frequently in the chest wall itself and at various points along the path of the lymphatics leading from the mammary gland. Such recurrences may form anywhere along the inner side of the ribs or make a chain of nodules reaching to the spinal column, but are more common at the inner ends of the ribs or more accurately of the intercostal spaces where the branches of the internal mammary artery perforate the chest wall, presumably because of the passage here of numerous lymphatics on their way to the mediastinal glands. In two of the cases here reported the local recurrence was in a lymph gland situated in the intercostal space at its inner end.

In a number of instances the writer has seen such local recurrences after radical removal of tumors which had not yet become attached to the chest wall, but were still freely movable, and also in cases where the primary tumor was in distant portions of the breast. It would seem that lymphatic infection at the edge of the sternum is comparable in frequency to that of the axillary glands, which would suggest the systematic removal of all subcutaneous tissues in this region down to the

¹ Read before the American Surgical Association, July, 1905

perichondrium in all cases of carcinoma of the breast, whether the tumor be in the internal or external portions of the mammary gland

In a certain proportion of cases these recurrences are local when discovered and may be successfully removed. The removal, however, requires resection of considerable areas of the chest wall, including all of its structures and entails opening of the pleural cavity on that side together with plastic closure of the defect.

It may be stated more broadly that regional recurrence after radical operation for carcinoma of the breast is very apt to involve the chest wall, and if such a nodule is to be successfully removed the underlying portions of the chest wall must be removed with it. This follows because in the modern radical operation for carcinoma of the breast practically all the subcutaneous tissues are removed from the whole breast area down to the periosteum and intercostal muscles, and any recurrent nodule growing beneath the skin may be considered to have invaded the intercostal muscles by the time it has become large enough to be detected. This is quite as true where the recurrence is the result of scattering of cancer cells in the connective tissue spaces as in purely lymphatic recurrence. Lenticular skin metastases in their beginnings are an exception to this rule.

Mr Jacobson advises operation in such cases, which he says may be done with the expectation of at least delaying general infection with the disease. He reports one case, however, in which the patient was free from recurrence two years after resection of the chest wall.

Sarcoma of the chest wall may arise in any of the structures from the skin to the pleura, but the more common varieties grow from the ribs or their cartilages or the periosteum. The operative relations of sarcoma are not materially different, save for the fact that some of the varieties are encapsulated. Infiltrating sarcomata require the widest and most radical removal, while the encapsulated tumors and particularly the desmoids and the giant-celled sarcomata and often the

endotheliomata may be enucleated. Still even here the section should be made well outside the capsule since such capsules are themselves often infiltrated.

The following statement of the technique to be employed in such cases is based upon the experience obtained in the cases here reported.

A wide skin incision is made of such shape as to be readily closed by some simple plastic procedure. A curvilinear 111-angle answers admirably.

The chest is then opened through an intercostal space at some distance from the tumor sufficiently to permit of exploration of the inner surface of the ribs in the neighborhood of the tumor. By this means much can be learned of the extent of the growth and the presence or absence of involvement of the lung or pericardium. This will determine the area of chest wall to be removed. Of course it is of the greatest importance to take out the tumor in one piece without section of tumor tissue, but in some cases this may not be possible.

The ribs are first cut on the outer side, *i. e.*, the side of greater fixation preferably without cutting the pleura. By this means the intercostal arteries can be most readily caught by means of a curved needle carrying a catgut ligature. Further advantage lies in the fact that if the pleuroperiosteal section be made a little nearer the tumor than the bone section, the flap of periosteum and pleura will offer some protection to the lung from the sharp edges of the ribs.

In these cases there were no untoward symptoms incident to the production of pneumothorax. It was noticed, of course, that the respiration became immediately deeper and more rapid as soon as an entered the pleural cavity, but, aside from the violent flopping of the heart from right to left, terrifying to look at but without noticeable effect on the pulse, there was no special inconvenience to patient or operator. This is quite in accord with the statement of Dr. Park (*ANNALS OF SURGERY*, 1887) that one side of the chest may be operated upon without resort to artificial respiration, and with the work of other surgeons. A notable operation by Koenig, quoted by Park

(*Arch f klin Chir*, 1902, vol xlvii, p 314), might be mentioned Trzebicky, in 1902, reported five extensive operations on the chest wall for the removal of tumors done without artificial respiration This statement of Park may be worthy of reiteration here in view of the numerous apparatuses which have been devised to overcome the effects of the artificial pneumothorax Doubtless Fell's apparatus and the Sauerbruch cabinet are of value in special cases, the latter essential in cases where there is likelihood of both sides of the chest being opened, but resection of the chest wall in the usual case can be done satisfactorily without these appliances Dr Keen reported a case in which he had removed a large sarcoma of the chest wall, and when the chest was opened he had tried to use Fell's apparatus without tracheotomy The apparatus did not fit the face well and was discarded, and the operation completed without the occurrence of serious symptoms The idea of Delagenierre that the chief danger in operative pneumothorax lies in the suddenness of its production (which led Dollinger to the establishment of an artificial pneumothorax under local anæsthesia twenty-four hours or so before performing an operation on the chest wall) is probably of considerable meaning and worthy of serious consideration Probably, however, most of the advantages of Delagenierre's principle can be obtained during the anæsthesia by allowing the air to enter the pleural cavity only slowly, giving the system reasonable time to accommodate itself to the new condition

In the cases here reported the writer found that the respiration could be greatly modified, and the tremendous lateral excursions of the heart and mediastinal tissues almost completely checked by the simple procedure of stopping up the opening in the chest wall with a wet towel The towel, folded into two or three thicknesses, is made to slip beneath the partially loosened section of chest wall which is to be removed, and is drawn forward as new cuts are made It is important to close the opening at the moment of complete expiration when the chest is largely emptied of air When this was done the lung expanded and the exaggerated and fatiguing expiratory

efforts were at once quieted. When by gradual leakage considerable amount of air had accumulated in the cavity, the towel was readjusted and closure made again at the moment of complete expiration.

In those cases where the tumor was at the edge of the sternum, it was found convenient after cutting the ribs to raise the tumor to the inner side, bending the costal cartilages to permit of work beneath. The internal mammary artery was readily caught above and below by passing about it a curved needle armed with catgut and was tied before being cut. The section of the sternum was made with bone shears and included about half its width.

Removal of the tumor in several cases gave excellent exposure of the upper pericardium and of the mediastinum which in one or two cases showed enlarged glands which were readily removed with the surrounding fatty tissue.

The wounds were closed in each instance by a large skin flap lifted up from some convenient region, generally the upper abdomen where the laxity of the skin permits ready closure of the defect. In one case a flap was taken from the opposite side of the chest, the very full breast being held towards the median line with adhesive plaster. This with reference to Dr. Richardson's notion of using the opposite breast to assist in closing the large wound left by the radical operation for carcinoma of the breast. The amount of air left within the chest was made much less by letting it out during expiration and preventing its reentrance by means of the closing flap, which to this end should be made somewhat larger than the opening in the chest wall. Absorption of the air was rapid so that in very few days the remaining pneumothorax was not demonstrable.

It was feared that the aspirating action of the lower pressure on the raw inner surface of the occluding skin flap would cause exudation in embarrassing amounts into the pleural cavity. This did not occur, however, unless in one case where a dulness was made out within a few days, but in this case there must have been some degree of infection, as the patient had a temperature of 100° to 103° F. for a week, and aspira-

tion failed to demonstrate fluid, probably a localized pneumonic process with pleurisy

In all of the cases the respiration remained more rapid than normally for a week or more, for which I think the soreness incident to the movement of the ends of the ribs in the unhealed wound is quite as accountable as the remnant of pneumothorax

The final condition of the wounds was satisfactory in all of the cases. Wide-spread but weblike adhesions were sufficient to prevent collapse of the lung during that operation in one case where a second operation was performed

I would report five cases of resection of the chest wall for recurrent carcinoma of the breast in four patients and one of removal of the clavicle and first rib and portion of the sternum for sarcoma which in point of operative technique presented a number of similar conditions

CASE I—*Recurrent Carcinoma of Breast over Fifth Rib, Resection of Fourth and Fifth Ribs, no Evidence of Recurrence after Two Years* Reported by courtesy of Dr Stanley Stillman, of San Francisco

Miss C had been operated upon in 1899, at age of twenty-seven, by Dr Lund, of Boston, for carcinoma of the right breast. In 1900 a recurrence in the scar was removed by Dr Lund, in San Francisco, and in 1901 patient presented a hard, flat, immovable tumor about five centimetres in diameter situated over the fifth rib just outside the epiphysis. X-ray treatment was used three times a week for eighteen months. For a time the tumor grew smaller, then it began to increase in size, and radical removal was determined upon. Dr Stillman removed some 5 centimetres of the fourth and fifth ribs with the adjoining intercostal tissues. Though the tumor projected through the chest wall, there were no adhesions to the lung and no mediastinal tumor was made out. The opening was closed by a skin flap lifted up from the abdominal wall. Recovery was rapid and uneventful. Patient was seen July 1, 1905, two years after operation, and showed no evidence of recurrence, but was in perfect health.

CASE II—*Recurrent Carcinoma of Breast at Edge of Sternum, Resection of Fourth and Fifth Costal Cartilages with Edge*

of Sternum, Recurrence in Mediastinum after Eight Months, disappearing under X-ray, but reappearing Five Months Later

Mrs W, aged sixty-six years, had been operated upon by the Halsted method in January, 1902, for carcinoma in the outer upper quadrant of the right breast, which had been noticed for a year, and which had begun to invade the skin and had produced a large axillary tumor. In the operation everything had been removed from the edge of the latissimus dorsi to the sternum and from the first rib to the tenth. The skin wound was so wide as to require swinging flaps to effect closure. In November, 1903 (twenty-two months later), patient returned with recurrent tumor in the scar at the edge of the sternum over the fifth costal cartilage, $2 \times 3 \times 1\frac{1}{2}$ centimetres in diameter, sharply outlined, but fixed. There was no evidence of axillary or other recurrence, and the patient being in good physical condition it was determined to remove that portion of the chest wall carrying the tumor. A curvilinear triangular incision 7 centimetres on each leg was made and a skin flap lifted up from the upper abdominal wall sufficient to close this defect. The pleura was opened enough to admit the finger, which showed that the tumor was of about the same size on the inner surface of the ribs as on the outer, but did not involve the lung. An area of chest wall about 7 centimetres in diameter was removed as described above. During much of the dissection the pleural opening was closed more or less perfectly by the hand of an assistant or by a wet towel, by which the respirations were kept quiet and but little deeper or faster than the normal. The skin flap was stitched in place over the opening with silk-gut sutures and the edges accurately approximated with catgut. Before sealing the wound, a pair of forceps was introduced between the stitches and the greater part of the air let out of the chest, the forceps being quickly withdrawn at the end of expiration. Immediately after the operation the respirations were 22, but as patient regained consciousness they increased to 40, probably as a result of soreness. On the second day they were 28 and remained at 30 for several days. On the eighth day the wound was dressed for the first time, it had healed by primary union save for slight redness of the wound edges, and on the eleventh day the stitches were removed, patient leaving hospital on the nineteenth day. On the

sixteenth day a few drops of pus appeared in the abdominal portion of the incision

In September, 1904, patient returned, showing two pea-sized recurrent nodules beneath the skin in the mediastinum. Further operation was deemed useless and patient was referred to the X-ray department of Lane Hospital for treatment. After 20 treatments by Dr. Lehmann during eight weeks, the nodules were no longer palpable, and patient returned home. In February, five months later, I was informed by letter that one of the nodules had begun to enlarge again, and that patient was very weak, probably from internal metastasis.*

CASE III—Recurrent Carcinoma of Breast at Edge of Sternum, Resection of Third and Fourth Costal Cartilages with Half of Breadth of Sternum, Recurrence in Original Scar apart from Field of Last Operation, Pleural Carcinoma, Death from General Carcinosis Five Months Later

Mrs. D., aged forty-five years, was operated on in February, 1903, by Halsted's method for a large spherical, rapidly growing carcinoma of the left breast with large axillary tumor, patient was very fat and had noticed the growth only five months before. In July careful examination failed to show any recurrence. In November several small nodules were discovered in the lower anterior part of the scar and were excised, the dissection going only to the periosteum. In March, 1904, two other recurrent nodules were found at the border of the sternum in the original skin, the flap of the last operation remaining free. As in Case II, the region about these nodules, 12 centimetres in diameter, was excised. One of the nodules was seen to penetrate into the fourth intercostal space. The patient being in good condition the pleura was opened through an intercostal space nearby and the inner surface of the wall examined with the finger. The tumor did not appear to have penetrated to the pleura, and the lung was free, but an enlarged gland was detected at the edge of the mediastinum.

The fourth and fifth costal cartilages were then cut away, the internal mammary artery tied and cut, and a section of the sternum $1\frac{1}{2} \times 5$ centimetres removed. A second enlarged gland in the mediastinum was removed with the fatty tissue about it. Because of the retraction of the lung, a large area of the chest

* Reported to have died August 13 of cerebral hemorrhage

wall was exposed to view, but no further recurrences were evident. After operation the pulse was 96 and respiration 30, but patient complained of very great pain. For the next week there was considerable fever, 99° to 103° F, pulse 90 to 110, with a good deal of pain, evidently a septic pleurisy or superficial pneumonic process. On the fourth day patient was more comfortable and sat up in bed. Some dulness was detected, presumably from effusion. On the eleventh day stitches were removed and a small abscess evacuated in the abdominal part of the incision. On the eighteenth day patient left hospital, respiration still 30, pulse 110. In May, two months later, patient returned with small recurrence external to last operation, and with wide dulness over left chest. Several punctures with needle brought no fluid, the dull area being probably caused by pleural carcinoma, further operation was out of the question. Patient died in July, four months after the resection of the chest wall and seventeen months after the Halsted operation, twenty-two months after patient first noticed the tumor.

CASE IV—Recurrent Carcinoma of Breast at Edge of Sternum, Inner Ends of First and Second Ribs and Portion of Sternum and Mediastinal Glands removed, Internal Mammary Artery tied at its Origin, Further Recurrence below, Resection of Third and Fourth Ribs, Patient well Six Months after Last Operation, Twenty-two Months after Halsted Operation

Mrs M, aged fifty-three years, was operated on by Halsted's method in August, 1903, for a large suppurating carcinoma of the upper outer quadrant of the left breast with large axillary tumor. Patient was very fat, had noticed the tumor but four months before. This had been incised by the family physician for infection, suppuration continuing, and tumor grew out of the incision. After the operation much of the flaps used to close the incision about the drainage tubes sloughed and the resulting raw surface was so large as to require the application of Thiersch grafts, which was done as soon as the suppuration permitted. In August, a year later, patient returned with recurrence, 3 centimetres in diameter at the edge of the sternum, over the second intercostal cartilage. The tumor was widely circumscribed, the second rib cut across, opening the pleura 5 or 6 centimetres external to the border of the sternum and the internal mammary

secured by double ligatures in the second intercostal space and divided between. The first rib was then similarly cut and the sternum divided with bone forceps from below nearly in the middle line and as far as the level of the sternoclavicular joint. The mass was then turned upward to give access to the upper portion of the internal mammary artery, but it was not found practicable to secure the artery as high up as was desired, so it was caught in forceps in the first interspace and freed from the first rib. The tumor mass with first and second ribs, portion of sternum and sternoclavicular joint, was removed. It was then a simple matter to tie the internal mammary artery well above the position of the first rib and to remove the pleura and other tissues which had been in proximity to the tumor. The wound was closed with a large flap lifted up from the right side of the chest.

The patient was somewhat cyanotic during the early part of the operation (patient was very fat and had her chest cavity still further compressed by abdominal fat), but the pulse remained strong and regular. Through a considerable part of the operation the pleural cavity was well enough closed with a wet towel to permit of considerable expansion of the left lung, and when the towel was used the respiration was markedly quieter and approximated the normal.

After the operation the pulse was 82 to 100 and the respiration about 30. Primary union occurred and patient left hospital on the twentieth day. In the following November patient returned, but showed no evidence of recurrence. She was strong and well and able to do hard work. In January a small nodule was found at the edge of the sternum in the third intercostal space. A second resection of the chest wall was therefore done, since there was no sign of other recurrence, in which the third and fourth ribs and edge of sternum were removed. Gauzy but widespread adhesions of the lung to the parietal pleura prevented collapse of the lung so that the operation was much simpler than the previous one. It was interesting to note the demonstration of the portion of the heart which is uncovered by pleura, for this was beautifully shown when in expiration, the lung being confined by adhesions belled forward all around this area.

On September 2, a third resection of the chest wall was done, this time for a recurrent nodule on the opposite side of the sternum. The inner ends of the second, third, and fourth ribs were

removed with the intervening soft parts as well as the sternum for its entire width and from the clavicular joint to the attachment of the fifth costal cartilage. Attached to the sternum and removed with it was a mediastinal tumor the size of a walnut. Considerable fatty tissue of the mediastinum was taken with the tumor, the dissection exposing the aorta. No serious symptoms resulted from the acute pneumothorax on the right side as the left lung in spite of the pleural adhesions and lessened mobility of the chest wall resulting from the previous operations gave sufficient breathing tissue. The wound was closed by a transplanted skin flap and the patient made a rapid recovery, leaving the hospital on the 18th day.

CASE V —Sarcoma of Clavicle involving First Rib and Sternum, with Large Mediastinal Tumor, Resection, Recovery, Patient being Well and Strong at the Present Time, Eleven Months after the Operation

W H H, aged seventy years, teamster, presented a large tumor at the base of the neck on the left side, fixed to and probably originating in the clavicle. Two years before he had injured the collar-bone, and three or four months afterwards noticed a small tumor near the inner end of the clavicle. The tumor continued to enlarge till it reached the size of about 10 x 15 x 8 centimetres, the long diameter being vertical. It covered the sternoclavicular joint and extended well up on the neck and over the upper chest. The skin contained many dilated veins, but was movable over the tumor, which was smooth in general outline, though coarsely lobed. Patient's general physical condition was excellent.

On August 16, 1904, under chloroform, the skin was incised, the edge stripped back, and the clavicle exposed and cut at the junction of its middle and outer third. The greater pectoral was cut across and the sternocleidomastoid divided about its middle. The clavicle was then tilted upward and the subclavius muscle divided. The first rib was then cut at a point internal to the subclavian vein without opening the pleura, the intercostal muscles cut, and the whole mass turned inward. A large lobe of the tumor the size of a hen's egg projected beneath the sternoclavicular joint into the mediastinum. In dissecting the subclavian vein from the tumor it was punctured near its point of union with the internal jugular. A little air entered, but compression with a gauze pledget sufficed to close the opening during the dissection.

In order to complete the separation of the vessels from the tumor the under side of the ligated external jugular was used as a guide and answered admirably. The internal mammary artery was not adherent to the tumor, but was lifted off it with the parietal pleura.

Because of the great depth to which the mediastinal lobe of the tumor extended, the uncertainty as to the quantity and character of adhesions of this lobe to the important structures of the mediastinum and the great difficulty of dissecting beneath so large a tumor, it was impracticable to complete the operation without dividing the tumor. Accordingly, the greater mass of the tumor was torn across and then section of the sternum was made with bone shears. The remainder of the tumor was then removed without difficulty.

While the pleura was not opened in this operation, the upper portion of the pleural sac was so widely freed from its parietal attachments that there was almost as much interference with the respiration as if the pleura had been opened and the bulging of the pleura into the wound with every expiration was annoying.

Whenever the pressure on the subclavian vein was released air would enter, and this occurred four or five times, but the quantity was small and it seemed to make no difference with the patient's breathing or pulse. The opening was finally closed with fine silk suture and fortified by a flap of fascia stitched over the suture line. The thoracic duct was not injured, as it probably would have been had not the external jugular been used as a guide and all the dissection carried on in front of it.

The wound was closed with drainage. Patient made a rapid recovery, being out of bed on the seventh day and leaving the hospital on the twelfth day.

At the present time (July 1), eleven months after operation, patient is continuing at his work as teamster, and his physician writes that he is well, having withstood an attack of grippe which tried his lung and shoulder in the coughing. There is no sign of recurrence as yet. Histologically, the tumor was an endothelioma.

In recapitulation, the writer would hazard the opinion that, although, to quote Watson Cheyne, "The patient's chance is in the first operation," there is still some chance for a certain proportion of cases with recurrence in sufficiently radical resection of the chest wall. Recurrences of the sort indicated are apt to be developed from remnants of the original tumor and

may in themselves be purely local. Radical dissection of the axilla is frequently followed by freedom of recurrence in that region because of the interruption of the process of metastasis by the lymph-glands. May not, in certain cases, the same thing be true of removal of infected lymph-glands of the chest wall and anterior mediastinum?

The artificial pneumothorax, if unilateral, presents no dangers sufficient to constitute contra-indication to the operation in patients well enough otherwise to warrant operation. The fatiguing respiratory efforts which supervene when the chest is opened may be almost entirely done away with by the use of a wet towel, covering the opening during the dissection.

As for results, it may be stated that of the six operations (including that of the sarcoma) there was no mortality, although most of the patients were well along in years, the ages at the time of the resections being 40, 46, 54, 68, and 70, with average of 55, and all except the sarcoma case having undergone radical Halsted operation, three cases within a year, the fourth within two years.

Of the four cases of recurrent carcinoma, one is dead four months after the operation (the tumor in this case was one of more than ordinary malignancy and rapidity of growth), one had further recurrence in the mediastinum after eight months, which disappeared under the X-ray but reappeared five months later, though patient is still living twenty months after the operation and twenty-eight months after the original Halsted operation, one had further recurrence in the next lower intercostal space for which a second resection was done in January last and is at present, six months later, free from recurrence, eleven months after the first resection and twenty-two months after the Halsted operation, and, finally, one is free from recurrence two years since the resection. (Case of Dr Stillman.)

It is fair to state that in all of these cases but one, life has been prolonged, but it is still too soon, of course, to say whether any of the three cases which are to-day free from recurrence will remain so.

NON-PARASITIC CYSTS OF THE SPLEEN¹

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OUR knowledge of this subject has a twofold origin. First, the few and comparatively recent clinical reports, and, second, the somewhat more numerous accidental autopsy findings. The results of these two sources of information do not seem to agree, and, as will be seen later, it by no means follows that the two are intimately related, for the discovery, *post-mortem*, of a number of small, latent, cystic formations in a spleen does not seem to necessarily bear on the fact that in certain rare cases patients suffer during life with a formidable hæmatoma which originates in the spleen and demands surgical relief.

Up to 1904 the subject was practically ignored by writers, but that year witnessed the publication of not less than three monographic articles, each written in ignorance of the efforts of the other authors. These articles are by Heinrichs (*Arch f klin Chirurgie*, 1904, lxxii, 138), Monnier (*Beilage z klin Chirurgie*, xli), and Laspeyres (*Centralblatt f d Grenzgeb d Med u Chirurgie*, 1904). Heinrichs's article is the most comprehensive, as it deals with both clinical and autopsy material. Monnier's paper has to do only with splenectomy cases. Laspeyres devotes a section to the latter in a monographic article on splenectomy in general. The writer presents the subject at this time, first, because he has notes of an unreported personal case, and, second, because, so far as he knows, the matter has not yet received attention in English or American literature. In addition to the author's case, two others are added which seem to have been overlooked by other

¹ Read before the American Surgical Association, San Francisco, July, 1905

writers, the total being thirty-two. This number by no means represents the frequency of the disease, for Heinrichus cites numerous bare statistics of splenectomies in various clinics which show that this operation has been done a number of times for non-parasitic cysts, although no details are forthcoming. Of the chance autopsy findings collected by the same author, possibly half a dozen were large unilocular hæmatomata which, for some reason, never came to operation. So we may assume that from fifty to sixty of these large cysts have been known to exist, this number might perhaps be increased by correspondence. However, the condition is at best rare, and it may have lost some of its clinical interest from the conclusion reached by authors that it merely represents an indication for splenectomy, an operation the safety of which improves steadily from year to year.



FIG 1.—Author's case of hæmorrhagic cyst of spleen. Male, 18 years

In this paper the author will first relate his own case, and then append a brief table of thirty-one other observations, endeavoring to analyze these as they stand.

AUTHOR'S CASE—In September, 1895, Dr H M Ogilbee, of Manitou, Colorado, kindly referred a young man of eighteen years, who presented a large, left-sided, abdominal cyst (Fig 1). The mass was of four years' growth, there had been gradual

loss of flesh and strength, anorexia, headache, and general pressure symptoms. Fluctuation was plain. The diagnosis of splenic cyst seemed positive. *Operation*—St Luke's Hospital. A free incision was made over the prominent part of the tumor, the walls of which were found to be about one-half of an inch thick, semicartilaginous, and solidly adherent to all adjacent structures. Extirpation seemed impossible. (Later autopsy findings confirmed this.) The single cyst held several litres. Posterior incision, through drainage.

The walls of the cyst did not collapse, and the patient died of septic absorption from the cyst wall on the twelfth day. Autopsy with microscopic examination by Dr H C Crouch, Professor of Pathology in the University of Colorado. Anatomical diagnosis, hæmorrhagic cyst of spleen. From the autopsy findings, the author could not see, as said, how the cyst could have been successfully extirpated.

TABLE OF CASES

No	Operator Reference	Sex Age	Clinical History	Symptoms	Treatment	Result	Character of Cyst
1	Péan Des tumeurs de l'abdomen, 1, 1880	F 7	Swelling and pain for two years, with recent exacerbation	Fixed, very painful tumor, fluctuating in places Diagnosis of ovarian cyst	First recorded operation, 1863 Opening with caustic and injection of iodine Second recorded operation, 1867 Laparotomy followed by recognition of splenic cyst, which, having a pedicle, was readily extirpated after emptying it by puncture and dividing its adhesions Operation, 1879 Opening with caustic followed by incision	Death from peritonitis two months later Recovery Patient in good health two years later	Serosanguineous cyst Unilocular cyst springing from spleen Capacity, three litres Contents, hæmorrhagic
3	Péan (Ibid)	F 54		Diagnosis of abdominal cyst		Death in a few days from peritonitis	Serosanguineous cyst
4	Marcino and F. C. rcal, Progrès Méd., 1874 p 262	M 38		Diagnosis of malaria with abdominal cyst	Third recorded operation, 1874 Opening with caustic followed by puncture and use of retention cannula	Recovery, with persistence of small fistula three months later	Serosanguineous cyst
5	Credé Arch f klin Chirurgie, 1883, xxviii, p 401	M 41	Tumor first noticed one year ago Enlarged slowly, latterly more rapidly	Tumor size of child's head, slightly tender, fluctuating Pedicle to left and above Covered by omentum and intestines Diagnosis, hydro-nephrosis or cyst of spleen Movable, fluctuating mass	Laparotomy, September 25, 1881 Isolation of tumor and evacuation by puncture Pedicle very short, spleen and herent Splenectomy Pedicle buried, wound closed Laparotomy, 1884, and recognition of cyst of spleen Adhesions divided and spleen extirpated	Recovery complete after a half and a half months	Cyst grew from lower half of spleen, contained 1350 cubic centimetres yellow fluid, but slightly albuminous
6	Thornton Medico Chirurgica Transact., 1886, li, p. 407	F 19	First noticed two years ago	As suggested by foregoing Exploratory puncture, evacuation of five litres bloody fluid Rapid re-appearance	Laparotomy, May 17, 1883 Cyst ruptured, and four or five litres of fluid escaped Numerous splenic adhesions detached Resection of cyst wall in part Drainage	Recovery	One large and several smaller cysts, serous-gumous
7	Spencer Wells Brit Med Jour, 1889, ii, p 66	F 21	Maternal splenomegaly since childhood Two years ago tumor noted in ovarian region Subsequent pregnancy (normal), followed by increase in size of tumor and secondary peritonitis			Recovery One year later patient well	
8	Fink Zeitschrift f Heilkunde, 1890, x, p 353	M 14	Rapidly growing tumor, left upper abdominal region	Tumor extending from ribs to third's breadth below navel Nodular, soft, elastic, fluctuating, mobile Diagnosis of splenic cyst	Laparotomy, November 10, 1888 Tumor size of child's head, occupying lower half of otherwise normal spleen, resected with thermocautery	Recovery Patient well six months later	Serosanguineous cyst of 1500 cubic centimetres capacity

TABLE OF CASES — Continued

No	Operator Reference	Sex Age	Clinical History	Symptoms	Treatment	Result	Character of Cyst
9	Bardenheuer Deutsch Med Woehenschrift, 1896, No 36	F 47		Tumor size of child's head, adherent to lesser pelvis. Pain in left side of abdomen. Note digestive disturbances.	Laparotomy and extirpation of splenic cyst	Recovery	Cyst contents thin, and of a dirty, chocolate brown color. Cyst walls fibrous.
10	Terrier, Bull et Mém Soc de Chirurgie, 1892, p 661	F 33	First noticed pain in left side, followed by appearance of tumor	Tumor at level of umbilicus, size of fist, fully movable, with pedicle. Diagnosis, cyst of omentum or spleen, probably hydatid.	Laparotomy, November 16, 1891. Recognition of splenic cyst, which was punctured and then extirpated	Recovery One year later spleen slightly enlarged	Cyst grew from concavity of spleen. Contained blood.
11	Schulz Arch f klin Chirurgie, 1895, xlix, p 629	F 36	Ill for past two years. Tumor noticed five months ago. Presure symptoms	Smooth, painless, fluctuating mass, movable below. Absence of hydatid thrill and friction murmur. Diagnosis of hydatid or splenic cyst.	Laparotomy. Extensive adhesions of spleen. Extirpation of spleen after examination of eight litres of fluid and divisions of many adhesions.	Recovery complete	Spleen nearly transformed into a large serousanguineous cyst.
12	Moreschi and Ghetti Gaz degli Osped, 1896, No 119	F 42	Direct violence followed by painful swelling, increasing rapidly in size.	Examined a month after suppression of symptoms. Diagnosis of enlarged and floating spleen.	Laparotomy, August 14, 1896. Splenectomy after division of adhesions with colon.	Recovery	Serosanguineous cyst on anterior surface of spleen.
13	Bacelli Il Poli clinico, 1897, No 6	F 27	Direct violence. Two months later, tumor noticed in left hypochondrium, slowly increasing in size.	Smooth, soft, elastic, and fluctuating mass, attached to lower border of spleen. Movable, and but little sensitive.	Tumor twice punctured, with escape of pure blood. Did not refill.	Recovery One month later small swelling still perceptible.	Probably a subcapsular hemorrhage of slow development, which disappeared when an outlet was furnished.
14	Heurtaux Bull et Mém Soc Chir urgie (Paris), 1898, p 928	F 27	One year ago noticed tumor, which steadily increased in size.	Large, fluctuating mass occupying three-fourths of abdominal cavity.	Laparotomy. Cyst incised and washed out, then marsupialized.	Support for a year. Injections of iodiform, etc. Recovery after lumbar counter opening and drainage.	Capacity of cyst, 10 litres, contents, bloody chocolate colored fluid.
15	Bagnsky Berl klin Wochen schrift, 1898, No 2	F 12	Swelling of left side shortly after violent fall.	In left hypochondrium, an elastic, fluctuating mass extending across median line. Exploratory puncture, diagnosis of hemorrhagic cyst of spleen.	Operation, May 3, 1896, by Professor Glick. Cyst sutured to peritoneum and skin. An elliptical piece excised from cyst wall. Evacuation of two litres of fluid, cyst cavity tamponed.	Recovery (radical cure, in six to ten weeks)	Excised piece of cyst wall showed some normal splenic tissue.
16	Michailowsky XIII Internat Congrès, Paris, 1900		Malan splenomegaly. Trauma.	Traumatic blood cyst of spleen.	Splenectomy	Recovery	

17	Subbotic Zeitsch f Chi- rurgie, 1900, liv, p 487	F 40	Malarial splenomegaly, peri- splenitis, floating spleen	Splenectomy for splenomegaly, 1897	Recovery	Spleen also seat of small multiple cysts, some serous, others hemor- rhagic
18	Subbotic (Ibid)	M 30	Tumor size man's fist beneath left costal arch Diagnosis echinococcus or blood cyst of spleen	Operation of incision and drainage, 1892 Parietal peri- toneum adherent to wall of tumor Evacuation of 1500 cubic centimetres of bloody fluid and clots Peritoneum not opened	Recovery, with small fistula	Hemorrhagic perisple- nic cyst, from subcap- sular hemorrhage Eventual adherence to peritoneum
19	Subbotic (Ibid)	F 21	Tumor larger than a man's fist beneath left costal arch Ad- herent to peritoneum	Incision and drainage, 1897 Escape of two litres of bloody fluid Clots also in cyst	Recovery	Hemorrhagic perisple- nic cyst Correct diag- nosis before operation
20	Subbotic (Ibid)	F 30	Diagnosis of chronic splenome- galy, with lymphatic cyst at hilus of spleen	Splenectomy, 1898	Recovery	Cyst size of hen's egg close to pedicle of spleen, cavity traversed by septa, wall continuous, with splenic capsule
21	Leconte Cited by Henricus See No 29	F 55	Tumor in pit of stomach Di- agnosis, cyst of gastrosplenic ligament	Splenectomy Lesion found to be unilocular cyst of spleen with almost complete atrophy of latter	(?)	Serosanguineous cyst
22	Reimann "Ueber Milzsystem," Diss Leipzig, 1901	M 33	Spleen enlarged and irregular in form and consistence Pressure symptoms upward Trial puncture brought away old hemorrhagic fluid	Operative puncture at repeated intervals No improvement Radical operation refused	No benefit	Serosanguineous cyst
23	Routier XIV Con- grès de Chirurgie, Paris, 1901, p 157	F 24	Tumor first noted nine years ago Gradu- ally increased in size One year ago began to grow more rapidly	Splenectomy, February 5, 1901	Recovery	Splenic tumor occupied lower half of organ, upper part being nor- mal Composed of multiple, organized hematomata
24	Lehrs XIV Con- grès de Chirurgie, Paris, 1901, p 158	F 43	Tumor in splenic area tapped from behind and in front, with evacuation of old hem- orrhagic fluid Superven- tion of symptoms of infection led to intervention	Operative lumbar incision on January 3, 1901 Escape of one and a half litres of dark, bloody fluid Sac washed out and drained Extended iliac crest, lumbar region, and navel	Recovery	Probable subcapsular hemorrhage of spleen, with resulting peri- splenitis
25	Dallinger Medi- cin Observed by Der, 1901	M 44	High temperature Increased splenic dullness	Splenectomy	Recovery	Subcapsular hemor- rhage of spleen, capsu- lar adhesions Splenic tissues softened Blood, partly liquid and partly clotted, was present in the cyst

TABLE OF CASES — *Concluded*

No	Operator Reference	Sex Age	Clinical History	Symptoms	Treatment	Result	Character of Cyst
26	Chavner Bulletin Méd., 1902, xvi, p 24	M	Many years before had spleen Subsequent digestive disturbances Recent acute exacerbation, violent pain, tympanites	Diagnosis of intestinal occlusion	No operation	Death in two days	Autopsy showed tumor of spleen, non adherent Represented a subcapsular hematoma with consecutive atrophy of spleen Tumor much larger than spleen Death from rupture of stomach Blood cyst of spleen
27	Jordan Centralblatt Chirurgie, 1903, No 36	F 46	Recently, with good previous history local and general symptoms and beginning tumor in left hypocondrium	Bulging in left hypocondrium Tumor moved on respiration with rough friction murmur Appeared to be a cyst, not tender, and some movable	Splenectomy, 1899	Recovery	
28	Monnier Beilage Klinische Chirurgie, xli, 1903-4, p 181	F 21		Bulging in left hypocondrium Tumor moved on respiration with rough friction murmur Appeared to be a cyst, not tender, and some movable	Operation, June 12, 1903, by Professor Krönlein Cyst of upper part of spleen, adherent to surrounding tissues Puncture brought away bloody fluid Splenectomy after division of adhesions	Recovery	Capacity of cyst, three and a half litres
29	Henricus Arch. f. Klin. Chirurgie, 1904, lxvii, p 138	F 14	Tumor noted shortly before operation General health good	Mass reached nearly to pubes Smooth, tense, freely movable Uterus and ovaries normal	Operation, March 21, 1900 Spleen found displaced downward, and twisted on pedicle, with tumor growing from outer portion Splenectomy	Recovery Patient well three years later	Splenic tumor, cystic, capacity, 800 cubic centimetres, size of child's head, contents, hemorrhagic Grew from outer lower portion Unilocular cyst
30	Powers	M 18	Tumor had been growing for four years	General failure of health, pressure symptoms	Operation, September, 1895 Incision Tumor universally adherent Freely opened, evacuated, and drained Walls were thick and semi cartilaginous, and did not collapse	Death on twelfth day, from sepsis due to absorption from cyst wall	
31	Leonte XIV Congrès Chirurgie, Paris, 1901	F		}	Both cases operated on by marsupialization	Both recovered	Both unilocular, serous sanguineous cysts of spleen capacity, 1400-2000 cubic centimetres
32		F					

BRIEF ANALYSIS OF THIRTY-TWO TABULATED CASES

Etiology—These thirty-two cases represent the known clinical material which has been under observation during life. In all but one (Michailowsky) the sex is given, viz, male 8, female 23. In twenty-one female cases the ages are given, and we learn that the very great majority (eighteen) occurred during the menstrual years, at least sixteen in the childbearing period. Making due allowance for the influence of injuries and diseases of the spleen, and for the fact that in some instances the cysts were a long time in developing, there seems no reason to doubt that these occur often enough in women during the reproductive cycle to give the affection a gynæcological bias. If we study the cases discovered in chance autopsies, the data, while scanty, do not appear to show this; so that we are perhaps justified in regarding menstruation and parturition as merely aggravating causes. In a few instances the cyst became much enlarged by childbirth, and perhaps full particulars of the history—which details are often wanting—would increase the number.

Aside from the teachings furnished by sex and age the meagreness of many case-histories renders further data as to causation of limited significance. Traumatism and antecedent disease of the spleen (specially malarial enlargement) undoubtedly act as contributory causes in not a few cases, in as many others, however, such factors are wanting. Whatever the original cause, we often find recorded an acute exacerbation which brings the patient under medical observation. Aside from childbirth, we know nothing of the causes of such exacerbations.

Symptoms—After the cases came under medical observation, the cystic character of the tumor seems to have been generally recognized, although in a few cases the diagnosis—rightfully or wrongfully made—of an enlarged or floating spleen is recorded.

Diagnosis—The precise diagnosis, both as to origin and character of the cyst, was seldom made, although in some cases

it was recorded as a possibility, that is, it was noted as one member of an alternative

Treatment —When we come to treatment, we find that of the thirty-two cases one died of intercurrent rupture of the stomach before operation could take place (Chavier) In two of Subbotic's cases the spleen was really removed for chronic hypertrophy, and the discovery of complicating cystic formations was simply accidental Finally, in one of Leonte's cases (No 21), not accessible at first hand, the reviewer (Heinricius) omits to state the result of the operation (splenectomy), although we have every reason to believe that it was successful This leaves twenty-eight cases for consideration Analyzing these, we find that the patients have been treated as follows simple puncture, 3, incision and injection, 2, incision and drainage, 5, marsupialization, 3, extirpation of cyst, 5, extirpation of spleen, 10

Puncture —Of the three cases (4, 13, 22) of puncture (Marcano and Féréol, Baccelli, Reimann), in the first of which a retention-cannula was used, two patients made a relative recovery In one a fistula remained, and in another complete resolution did not occur The third was merely a case of palliative tapping, and no improvement resulted

Incision (and Injection) —The two cases (1, 3) thus treated were among the earliest recorded (Pean) Both patients died of peritonitis, the first after a course of iodine injections, the second soon after incision, probably anticipating injection treatment

Incision and Drainage —(This method includes tamponade) Of five cases (15, 18, 19, 24, 30) thus treated, three made complete recovery, and a fourth a relative recovery (persistence of small fistula) The fifth patient (author's case) died of sepsis

Marsupialization —Three cases (14, 31, 32) treated in this manner made good recoveries

Resection of Cyst —This operation was performed five times (Cases 2, 7, 8, 9, 10), and varied with the nature of the cyst If a pedicle was present, the latter was readily tied

off, otherwise the extirpation was effected as thoroughly as practicable. It is worthy of note that all of these operations were done at an early date (none subsequent to 1892). Four patients made complete recovery. The fifth, Terrier's case, made a relative recovery, the spleen being slightly enlarged and tender a year after operation.

Splenectomy—There were ten cases (5, 6, 11, 12, 16, 23, 25, 27, 28, 29) of this operation (we do not include two cases of splenectomy by Subbotin in which the operation was really done for chronic enlargement), and all recovered.

A comparison of these methods appears to show that puncture, incision, and drainage, and resection of the cyst proper, while able to secure permanent recovery in selected cases, are nevertheless untrustworthy, each having failed (in a part of a small series of cases) to produce cure, while several fatalities have resulted. Although marsupialization has a clean record in a small number of cases, it is manifestly restricted to those in which the integrity of the spleen is not compromised. On the other hand, splenectomy appears to be the only operation of general applicability, and to be a necessity whenever the spleen is extensively affected, either by pre-existing disease, or by displacement, or by atrophy due to the compression of large cysts, etc. We must bear in mind that the conservative operations are, as a rule, of relatively earlier date than the radical, and were employed largely in the thought that total ablation was fraught with great danger to the system at large. Those who first removed the spleen for this condition seem to have been very anxious as to the state of the blood count, thyroid, and bone-marrow.

Pathology and Nature—Not very much is to be learned from an analysis of the clinical material as to the actual nature of these cysts, most of the speculation as to the origin and development of the formations being based upon autopsy cases in which the cysts are small and latent. As has been observed, it is a long distance from the latter findings to cysts of surgical importance, and it is difficult to show a direct transition from the one to the other. Indeed, they may represent two

entirely independent conditions. The autopsy cyst is of common occurrence, one pathologist may encounter many cases in a lifetime. The clinically important cyst, on the contrary, is very rare, and few surgeons encounter more than one or two in an entire experience.

Clinical observation, however, teaches us these truths,—nearly all of the cysts which come to treatment are large and unilocular, and of the serosanguineous type. They contain from one to ten litres of fresh or old blood, and the greater the age of the cyst the greater the secondary alterations resulting from absorption of the fluid portion, decomposition of coloring matter, and persistence of organized fibrin, cholesterol, mineral matter, etc. The walls of the cyst consist of a varying proportion of splenic and fibrous tissue with corresponding variations in the thickness.

Without going into speculation based upon histological studies of small cysts found accidentally at autopsy, it seems safe to say that the typical cyst of the spleen, from the purely surgical stand-point, originates in a subcapsular hæmorrhage of whatsoever origin. This is especially true of the cases reported during the last ten or twelve years. We find a consensus of data which shows that the slight, continuous escape of blood beneath the capsule—never severe enough to present symptoms of internal hæmorrhage—causes a hæmatoma, and that the peritoneal capsule undergoes a low form of inflammation which almost invariably results in adhesion to the outlying tissues. If the tumor is of sufficient size, pressure symptoms result which may affect the thorax or abdomen, according to locality. If the peritoneal reaction is sufficiently intense, pain, vomiting, etc., may come on. If the pressure is exerted upon the spleen itself, the organ undergoes atrophy in time.

But although this seems to be the predominant form of splenic cyst, and one which is very sharply characterized, it by no means represents all the possibilities of the lesion. There are other cases in which the hæmorrhage cannot be regarded as subcapsular, but must be thought parenchymatous. The former has a free field in burrowing between the spleen and its

capsule, in accumulating in large amounts, and in causing perisplenic adhesions and pressure symptoms. The latter is deeper seated, smaller, and more localized, originating probably from rupture of a splenic blood-vessel. Its walls are composed originally of normal splenic tissue, which in time becomes transformed in part into simple fibrous tissue. While it tends to come to the surface of the spleen, the pressure symptoms and the peritoneal adhesions are much less in evidence. The difference between the two types is essentially one of degree. The contents of these cysts are the same, and under certain circumstances the two may produce in time the same clinical picture. Generally speaking, however, the parenchymatous variety is more strictly isolated, and is localized in a particular region of the spleen, the remainder of the organ being intact. It has even happened that these cysts have formed pedicles or have developed sessile attachments to a spleen otherwise normal. Hence it is not surprising, bearing in mind the former fear of extirpating the entire spleen, that the earlier operators employed conservative measures in dealing with these cysts, especially when they were clearly circumscribed. Nor can we, even at this time, deny that such sharply localized cysts are best treated conservatively in selected cases, especially when the cyst is pedunculated.

Non-hæmorrhagic cysts are of such rare occurrence clinically that they may be left out of consideration.

Some of the more recent writers, in view of the frequent complication of perisplenitis, are calling attention to the diagnostic value of a perisplenic friction sound, which is synchronous with respiration. Such diagnostic evidence, while obtainable in certain cases, seems to the writer of doubtful value.

Henricius states that the hæmatoma is readily distinguished from all other cysts as to origin and nature. It must be due either to rupture of a healthy vessel by trauma, or of a diseased vessel either spontaneous or traumatic. Probably as a result of the study of autopsy material, he adds that such ruptures may occur in connection with tumor formation (doubtless meaning angiomas). These blood cysts differ in

no wise from hæmatomata in other localities. Heinrichus appears to have overlooked the fact that the typical hæmatoma is subperitoneal or subcapsular, with an almost inevitable tendency to cause adhesions, at least, he speaks of the process as though it were essentially intrasplenic.

In regard to the evolution and symptoms of large cysts, Heinrichus states that they most often grow in the direction of least resistance, *i e*, downward and forward, yet he admits that in some cases the pressure is exerted towards the diaphragm. The relation of the growing cyst to the surrounding viscera and to local and general symptoms is not explained. Generally speaking, the tumor is of irregular contour, fluctuating in places, and rather insensitive. The rate of growth may be very variable. His statement that the cysts may rupture or suppurate does not seem to be borne out by facts.

Diagnosis must, as a rule, be made by exclusion alone. In addition to sources of confusion already cited, pleural effusion, cyst of the right lobe of the liver, and abscess of the abdominal wall may be added.

The patient's account of his own case possesses considerable value. Exploratory puncture can throw but little light on the origin of the tumor.

The operation almost invariably indicated is splenectomy, which is only contraindicated by extensive adhesions and extreme cachexia. Extirpation of the cyst is practicable only when a pedicle is present. Other interventions are condemned. They are essentially palliative and, moreover, dangerous.

Monnier explains the predominance of female patients in the reproductive cycle by the fact that the spleen becomes hyperæmic and relaxes during menstruation, pregnancy, and menopause. He thinks small latent cysts may become hæmorrhagic, but admits that no one has demonstrated a connecting link between them and the large hæmatomata. The blood count is of no value in diagnosis, since it undergoes no change. He is inclined to believe that the perisplenic friction sound has a limited diagnostic value, even if it only serves to exclude the possibility of extraperitoneal tumors.

PERFORATION OF THE GALL-BLADDER.

WITH A REPORT OF TEN CASES

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GALL-BLADDER perforations are comparatively rare, especially if we confine our observations to ruptures due to violence, ulceration, and gangrenous inflammations. But if we add to these the cases of cholecystitis in which inflammatory products have evidently escaped from or passed through the wall of an inflamed gall-bladder, even though we may not find the perforation itself, the number of cases is considerably increased.

When an abscess forms about an inflamed appendix, we speak of it as due to a perforation of the appendix. Such abscesses about the gall-bladder, either in the free peritoneal cavity or in the neighboring liver tissues, are rare as compared with appendiceal abscesses, but are not uncommon, and unquestionably should be included when studying perforations of the gall-bladder.

Fistulous passages between the gall-bladder and duodenum, stomach, or colon, are, of course, due to perforation of the gall-bladder, and usually to the ulceration through the visceral walls of a large gall-stone. Large-sized stones always pass in this way instead of through the ampulla. (Mayo)

Most perforations of the gall-bladder occur in neglected cases where gall-stones have been known to exist for long periods of time, and where the patient has had ample warning through many attacks of biliary colic. In such a patient, a secondary cholecystitis or an attack of typhoid fever brings the added risk of perforation of the gall-bladder, producing either septic peritonitis or a localized abscess.

In the medical literature of to-day we find a few reports of single perforation cases, and Drs Erdmann and Keen, in the ANNALS OF SURGERY some two years ago, collected thirty-four cases of primary typhoidal perforations. Of this number seven were operated upon, with four recoveries. Of the twenty-seven not operated upon, all died.

We may approximate the percentage of perforative cases by a careful study of Robson's 539 operations on the gall-bladder and bile ducts published in December, 1903. In the text he only speaks of five perforative cases, but if we carefully read the detailed histories of all of his reported cases, we will find that twenty-five of these cases can be fairly said to be perforative in character, or a percentage of 046 per cent. In his first 270 cases only seven are of this character, while in the last 270, eighteen, or 066 per cent. Of this number there are three cases of general peritonitis due to rupture of the gall-bladder, ten intraperitoneal abscesses, most of them containing gall-stones and usually situated between the gall-bladder and the duodenum, one in the head of the pancreas, containing a single gall-stone, several abscesses containing gall-stones, four fistulæ, three between the gall-bladder and the duodenum and one between the gall-bladder and colon. And there was one case where a gall-stone was found one-half in and one-half outside of the gall-bladder, still plugging the opening. Of these twenty-five cases there were five deaths, or a mortality of 25 per cent.

The Drs W J and C H Mayo, in 328 cases operated upon between June, 1901, and February, 1902, at St Mary's Hospital, found thirteen cases where gall-stones were lying in pockets outside of the gall-bladder. There were two subcutaneous abscesses containing gall-stones, and one case in which such abscess had ruptured, leaving a fistula discharging pus and gall-stones, a total of sixteen cases. Dr A J Ochsner, in the forty-eight cases operated upon at the Augustine Hospital in 1901, had one perforation, fourteen gall-stones were found in an abscess in the anterior abdominal wall. Single perforative cases from gangrene of the

gall-bladder are reported by Hotchkiss, Mayo, Robson, and Gibbon

Rupture of the gall-bladder from violence is rare, especially if in its normal state Dr John F Thompson's and Dr De Forest Willard's cases stand practically alone in this class In the latter the child was crushed by a wagon-wheel, and two months later Dr Willard found sixty-four ounces of encapsulated fluid which was almost all pure bile

CASE I—The first case of perforation of the gall-bladder that I ever saw was due to direct violence exerted upon an enlarged diseased gall-bladder Major W was a Civil War veteran, sixty years of age He was supposed to have suffered from chronic malaria, for which trouble he was sent to Minnesota some twenty years ago For many years he was a patient of Dr William Pepper, of Philadelphia, and he had seen all of the leading medical men of the East on account of periodic enlargement of the "liver," which was never associated with marked colic or jaundice I knew him as a friend and neighbor for many years, during at least ten years of his later life, when he was never seriously ill As a result of a gunshot injury received in the service, he wore a wooden arm Tripping, one day, on the street, he fell forward, with his arm bent under him so that the wooden fingers of the artificial arm pressed directly on his enlarged gall-bladder and caused it to rupture I saw him forty-eight hours later in consultation, when an operation would have been of no avail Later, I made a post-mortem examination and found a general septic peritonitis due to a perforation of a gall-bladder at least six inches in diameter, with very thick walls The rent in the anterior wall of the gall-bladder would admit my finger The gall-bladder contained over fifty large-sized old black stones and thirty-two ounces of thick pus, pus was also present in the peritoneal cavity

CASE II—Mrs S, (?) aged 35 years, seen with Dr Beal, of West St Paul, never had suffered from typhoid or jaundice, colic every other night for past two weeks, with evidence of upper peritonitis of a subacute character

Operation, November 30, 1899, universal adhesions, a small, thick gall-bladder containing six medium-sized gall-stones. A hard nodule in the under surface of the liver was opened and found to contain a single gall-stone of the same size, color, and shape of the other six. This cavity and the gall-bladder were drained, and the woman promptly recovered.

CASE III — Dr De W, aged fifty years, U S A. First attack of colic fourteen years ago. One year before I saw him, while serving in the army in Cuba, he broke down, and was invalided home with a return of his attacks of colic. He first became aware of the existence of a tumor in the gall-bladder for weeks before consulting me. Just as all preparations had been made for an operation, the tumor suddenly disappeared, and the patient felt better. Later, he commenced to suffer with night pains, pleuritic in character, in the gall-bladder region, and ten days later the operation was performed. A small abscess between the colon and the perforated gall-bladder was found. There were no gall-stones either in the biliary passages or in the abscess, but a perforation as large as a lead-pencil was found on the anterior wall of the thickened gall-bladder. The gall-bladder was drained, it should have been removed, for a mucous fistula still exists, and the colonel is perfectly comfortable while it discharges, but very uncomfortable when it attempts to close.

CASE IV — Mrs J, seen with Dr Jones, of Battle Lake, Minnesota. Patient was thirty-five years of age, had been sick and suffering with right hypochondriac pains for three weeks past. Universal adhesions were found binding the thickened, inflamed gall-bladder to the pylorus, duodenum, and colon. One large-sized gall-stone was found wedged into the cystic duct, the gall-bladder was filled with a thick, muddy, serous fluid. Under the gall-bladder was a small puddle of the same thick fluid, although no perforation could be found. Mrs J promptly recovered after drainage of the gall-bladder, and was well when last heard from, eighteen months after the operation.

CASE V — Mr A was almost a full-blooded Indian, living in the Indian Territory. Taken sick while travelling through the North-West. He had been sick for three weeks with a hard, pain-

ful tumor just below the edge of the ribs on the right side. He had a constant temperature of about 101° F and was slightly jaundiced.

At operation he was found to be suffering from gangrene of the gall-bladder and quadrate lobe. Drainage of the abscess with a tube was unsatisfactory, and he refused to be operated upon the second time. This patient died from sepsis eight days after the operation. Postmortem by Dr. Cameron, no gall-stones, but extensive gangrene of the gall-bladder and neighboring liver tissue.

CASE VI—Mrs. C., sent by Dr. Charles Germon, Balaton, Minnesota, sixty-one years of age, thirty years ago had suffered for three or four years with biliary colic, the attacks coming every few months and frequently lasting two or three hours. After this time she had no abdominal distress for twenty years.

Of late there had been a return of her old trouble, which was now more constant and more intense in character. She was jaundiced, with clay-colored stools, frequent chills, and irregular temperature. At the operation the small contracted gall-bladder was found densely adherent to everything, especially to the duodenum, which showed a well-marked scar of an old perforation. Three stones were found in the common duct. Cholecystectomy and choledochotomy were followed by recovery, and seven months later she reports herself cured.

CASE VII—Mr. B., aged twenty-five years, patient of Dr. Ramsey, of St. Paul. Last September I operated upon this young man for relapsing appendicitis during the interval, and removed a seven-inch appendix showing subacute inflammatory changes. Three days after the operation he developed a right lobar pneumonia, which resolved on the eighth day. He was perfectly well for two months, when he had an attack of cholecystitis, soon after he had an attack of obstruction, with marked impaction in the transverse colon, relieved on the tenth day. From this he quickly recovered and was well enough to be married. About two months after his marriage he had a second attack of cholecystitis, with persistent vomiting of bile. All nourishment was stopped by mouth, but still his vomiting continued three or four times each day he vomited about six ounces of a deeply green fluid. Operation was postponed because of his good general appearance and pulse which ranged about 80.

After he had been nourished and watered through the rectum for a month and was not able to retain even water, I operated upon him, and found a contracted gall-bladder adherent to all of the surrounding tissue, but no stones. A broad band of adhesions ran from the gall-bladder region down across both the duodenum and the transverse colon, markedly constricting them both. This was divided, and the gall-bladder was then removed. In removing the gall-bladder, I opened into an abscess of the liver, which contained three ounces of thick brownish pus just at the commencement of the cystic duct. Thinking that I had found the cause of all his trouble, I did not open the common duct, but stitched a tube into the stump of the cystic duct and drained the abscess cavity. He showed no bad effects from the operation, but his vomiting continued just the same, and, no bile being discharged from the drain, eight days later through a new opening I made a gastro-enterostomy by Mayo's latest method, when the patient immediately stopped vomiting, and is now perfectly well, having gained forty pounds in two months.

CASE VIII—Mr C, aged forty-five years, farmer, seen with Dr H Rees, of Maynard, Minnesota, at his own home, November 20, 1904. Patient had suffered from several distinct attacks of biliary colic, usually lasting for two to three hours. The last attack commenced two weeks ago and still continues. He has been very sick ever since, with a temperature ranging from 100° to 102° F, with frequent chills, slight jaundice, constant pain and tenderness, with some induration in the gall-bladder region. Operation in the farmhouse, opened an abscess which extended from the edge of the liver to the line of the umbilicus and contained a quart of bile-stained pus. The gall-bladder filled with stones could be felt in the upper wall of the abscess cavity, no attempt was made to demonstrate the perforation or to attempt to remove the stones at this time. The abscess was drained for four weeks, and the man slowly regained some flesh and strength, but he never felt well, and suffered some pain in the region of the liver, which was supposed to be due to gall-stones. On April 3, I operated upon him again at St Luke's Hospital, St Paul. I found a universally adherent, small, contracted gall-bladder containing thirty gall-stones and no bile. In attempting to explore the ducts, I found that the liver was

unusually fixed In separating adhesions between the upper surface of the liver and the diaphragm, I unexpectedly put my finger into a large subdiaphragmatic abscess, without withdrawing the finger, I cut down upon and resected two inches of the seventh rib in the anterior axillary line, opened the free pleural cavity and tamponed the opening all around with a thick veil of iodoform gauze until all breathing sounds were stopped, then opened the abscess through the diaphragm and let out fully eight ounces of thick offensive pus, a counter-opening was made in the back and thorough drainage made with a rubber tube This man made a slow recovery, seven days after the operation he discharged two gall-stones from the abscess He left the hospital six weeks after his operation with his sinuses almost closed and steadily gaining in flesh

CASE IX—Mrs C, seen with Dr Merrill, of Stillwater, Minnesota, aged thirty-two years, one child three weeks old, she had suffered a great deal of pain in the gall-bladder region during the last weeks of pregnancy Jaundice and tumor appeared ten days ago Exploration demonstrated an abscess adherent to the anterior wall containing fully six ounces of thick pus and six gall-stones She left the hospital two weeks after the operation, the discharge continued for a few days, but was entirely stopped at the end of three weeks There never has been any discharge of bile

CASE X—Miss C, aged thirty-two years, suffered from her first attack of colic in the fall of 1899 In December she developed typhoid, commenced having pain in the gall-bladder region during the fifth week She steadily grew worse, and was taken to Rochester, where she was operated upon by Dr W Mayo, January 22, 1900 A large abscess was opened in the gall-bladder region, which in the next few days discharged five large and twenty small gall-stones She left the hospital in about one month and remained well for about four years, when she suffered from a sharp attack of biliary colic

One year later she had a second attack, which was more intense in character and lasted three days About a month after this attack, February 17, 1905, I operated upon her, separated extensive adhesions to the gall-bladder and liver, and removed five old black stones from the gall-bladder and drained it Bile

commenced flowing on the third day, and she soon recovered, and is now apparently quite well

I have operated upon eighty gall-stones cases, nine of which were perforative in character, and one postmortem, making a total of ten, which seems to be a large proportion as compared with other lists of cases already on record. There were eight recoveries and one death. In this fatal case I believe that the result would have been the same even though the gall-bladder had been removed, because, with gangrene of the gall-bladder and the neighboring tissues, and especially in the presence of a localized abscess, any operative work which disturbed the abscess wall would only have spread the infection and lessened the chance of recovery. I believe that in any perforative case which has gone on to the formation of a localized abscess, the wisest course is to open and drain the abscess, waiting until a later time to deal with the gall-stones or the disease of the gall-bladder.

In perforative cases where the infection is not localized, then cholecystectomy with local, if necessary, drainage of the kidney pouch and the pelvic cavity with the Fowler position gives the patient the best chance of escape.

If these cases prove anything, it is that gall-stones should always be removed as soon as the diagnosis can be made, and in the interval, before complications have arisen to increase the danger and lessen the certainty of a perfect recovery.

THE VALUE AND PLACE OF DUODENOCHOLEDUCHOTOMY IN GALL-STONE SURGERY

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DUODENOCHOLEDUCHOTOMY was devised to accomplish the removal of offending gall-stones in that part of the common duct included within, or adjacent to, the walls of the duodenum, more particularly to remove stones impacted in the diverticulum of Vater. In this class of cases and in neoplasm of the papilla and, more recently, in removal of pancreatic calculi this operation has a distinct place and meets the requirements satisfactorily.

McBurney¹ in 1891 devised and first performed this operation for a stone in the duodenal part of the common duct with recovery of stone and patient. In 1894, without knowledge on his part of McBurney's procedure, Kocher² employed the same route. Kehr,³ independently of Kocher, performed the operation in 1894. Pozzi⁴ in 1894 likewise performed the operation successfully. Robson⁵ in 1897 did the operation probably for the first time in England. Up to the end of 1899, according to Kocher, the route had been employed twenty times with two deaths. To this number Thienhaus,⁶ by collecting 8 cases and contributing his own, added 9. Besides these Robson⁷ has reported 13 of his own cases and 1 of Dalziel.⁸ Of these some and the one of Moynihan⁹ were for pancreatic calculi, alone or with gall-stones. McBurney has done this operation in 11 cases, of which 9 are through his kindness reported for the first time by the author. W J Mayo has employed the operation 6 times, 4 times for stone and twice for neoplasm of the papilla. Of these 4 are herewith reported for the first time through his courtesy and 1 only is included in the statistics of Thienhaus. Kehr¹⁰ more recently reports 3 cases, and to these enumerated the author adds another. From this it will appear that without duplication so far as

known 33 cases are herewith added to the 29 cases already reported, making a total of 62 cases. Twenty of these, or approximately one-third, were collected by Kocher¹¹ for the period 1891 to 1900. Since then 41, or more than twice as many, have been done in the last five years, showing that the operation has found its place among established procedures. In view of the impetus of recent advances in pancreatic work the operation will doubtless acquire increased importance and usefulness.

Pantalon¹² discriminates between lithotomia transduodenalis and choledochotomia transduodenalis. The former devised and performed by McBurney consists in approaching the stone in the common duct near the papilla through an incision in the anterior wall of the duodenum and removing the stone by incising the papilla. Collins modified the last step by dilating the papilla and removing the stone. Kocher's¹³ operation of choledochotomia transduodenalis consists in immobilizing the stone in the duct between the fingers and after opening the duodenum, cutting directly down upon the stone through the duodeno-duct wall.

The scope of these procedures was originally confined to the removal of offending gall-stones from the lower end of the common duct, and of the series of 62 cases this was the purpose in 57 or approximately 92 per cent. Later it was made to extend to the relief of obstruction from neoplasm of the papilla. This was done in two cases or 3 per cent. More recently removal of pancreatic calculi by this route has been reported. Thus of the five cases of operation for pancreatic calculi collected by Robson and Clarke from the literature and reported by Robson¹⁴ three at least were modified duodenocholedochotomies. Of the indications for the operation the obvious is obstruction from a gall-stone impacted in the diverticulum of Vater, neoplasm or stricture of the papilla, and pancreatic calculi in the diverticulum or at, and adjacent to, the orifice of the ducts of Wirsung and Santorini. Indications of convenience, rather than urgency are obstruction from a stone not actually in the

lowest part of the duct but more accessible via the duodenum than from without by virtue of adhesions, and occasions according to Robson,¹⁵ "when the liver is small and the common duct cannot be made to reach the surface, its exposure through the duodenum may be simpler than the ordinary operation of choledochotomy" Zeller¹⁶ cites an interesting case in which he failed at operation to detect a stone in the lower end of the common duct by palpation and found it at autopsy by passing a probe through the papilla Since then he has practised sounding the end of the duct through the duodenum when the stone is not readily palpated and thinks the danger of infection is greatly overrated W J Mayo¹⁷ regards the operation as incomplete without a supra-duodenal-choledochotomy on the ground that the obstructing stone removed via the duodenum "may not be the largest present, and others may still remain in the duct," therefore he recommends "the common duct should at the same time be opened, explored, and drained" That this step is necessary or even desirable in all cases does not appear from the records of reported cases in which it was not done Drainage, of course, in such cases which represent the cumulative effects of chronic obstruction is important for the success of the work, and where the usually small and contracted gall bladder is not available for drainage purposes a supra-duodenal opening into the common duct may be desirable In the author's case, which is not cited here to prove that drainage is not necessary in most cases, the gall-bladder was removed after tying the cystic duct and no provision was made for drainage beyond that of a dilated common duct orifice which passed bile freely as soon as the obstructing stone was removed Moreover in regard to the size of the stone would it not usually be possible to recognize a larger stone in a location more favorable for recognition than a smaller one which had been recognized in a less favorable locality? A stone too large to be removed safely via the duodenal route should be removed by the supraduodenal way. Furthermore, duodenocholedochotomy as indicated above is preferred to supra-duodenal-choledochotomy in certain fixed

positions of the common duct as from adhesions or a small liver. In suitable cases supplemental supra-duodenal-choledochotomy ensures added thoroughness and effectiveness, especially when the procedure of drawing gauze strips through the duct between the upper incision in the duct and papillary orifice, as practised by Mayo and Kehr, is carried out.

In regard to the special technique incident to duodeno-choledochotomy McBurney¹⁸ lays stress on the following procedure. "In all cases which are not complicated by very deep adhesions involving the common duct and descending portion of the duodenum, it is easy and very desirable after determining the presence of a calculus in the lower part of the duct to pass the left forefinger through the foramen of Winslow to a point behind the calculus. With the finger the lower end of the common duct, the calculus, and the descending portion of the duodenum can be lifted forward so as to bring these parts nearly or quite to the level of the abdominal incision. The duodenum is then incised in its anterior wall for from one inch to one inch and a half, the orifice of the duct (which is usually markedly altered as to the color, etc.) is easily found and enlarged with knife or scissors or forceps, and the stone removed, all of this, and even the suture of the intestinal wound, should be completed without removing for a moment the left forefinger from its supporting position."

In choledochotomia-transduodenalis Kocher¹⁹ advocates suture of the incision in the posterior duodenal wall when one can be sure that the opening of the papilla will not thereby be narrowed. Robson,²⁰ on the other hand, has found no need as a rule to suture the posterior duodenal wall. As pointed out by Kocher, however, this is only admissible when the incision has been strictly within the wall of the duodenum and does not extend upward, so as to allow the escape of infected bile into the space between the duct and duodenum. The higher the incision, therefore, the greater the need of suture.

The objections to the operation are based on technical difficulties and postoperative danger. The difficulty in finding the papilla is overestimated and is apparently based on dis-

secting room studies where the absence of pathological guides is probably responsible for erroneous conclusions. In operating in the presence of pathological conditions we have as aids pointing to the position of the papilla first the calculus supported on the left forefinger and second with the duodenum opened the thickening and discolored appearance of the papilla. Those who have actually done the operation regard this difficulty rather fancied than real. The other principal technical difficulty is the depth of the wound. With the means of bringing the parts into the wound described above and aided by Robson's²¹ sand-bag under the lower dorsal spaces this objection is largely removed, and certainly does not apply to duodenocholedochotomy any more than to supra- or retro-duodenocholedocotomy.

Postoperative dangers are said to be twofold (1) duodenal fistula threatening starvation, and (2) infection leading to a fatal result. Of the 62 cases on whom the method has been used two have developed fistulæ. Of these, both Robson's²² cases, one case, No. 288, died three weeks after operation from exhaustion due to difficulty in feeding on account of the duodenal fistula. The other case, No. 431,²³ developed some leakage from the duodenum which ceased after a time. In regard to infection much light has been thrown upon the subject by the vast amount of work done in the upper abdomen. In view of the freedom with which the duodenum, upper bowel, and stomach have been opened, it is clear this danger is not greatly to be apprehended, provided care is used in the work. In surgery of the bile tract, especially common duct stone and more particularly the late stage with stone impacted in the diverticulum of Vater, it is the effect of obstruction and infection on the liver rather than peritonitis that causes death, as brought out by W. J. Mayo.²⁴

The mortality of the cases operated on by the method under discussion is briefly as follows: viz., 62 cases of all sorts with 8 deaths give a mortality of 12.6 per cent. Deducting from the number of cases the three pancreatic cases of Robson and the two neoplasm cases of Mayo and subtracting the 3

deaths in these five cases, we have respectively 57 cases and 5 deaths or 8.77 per cent for the mortality of duodenocholedochotomy in the gall-stone cases. Until comparatively recently, Robson's²⁵ mortality for choledochotomy was 16.2 per cent, but more recently has been lowered to 5 per cent. Kehr²⁶ has a mortality of 6.5 per cent and the Mayo's,²⁷ 11.1 plus per cent. It thus appears that the average of early and late duodenocholedochotomies gives a mortality per cent comparable with the more recent statistics of supra-duodenal-choledochotomy.

In order to determine whether or not there were operative any factors peculiar to duodenocholedochotomy in the 5 deaths in the stone cases, it will be necessary to go behind the returns and ascertain briefly the causes of death. One of McBurney's cases died on the third day after operation, in spite of all efforts to check it, of persistent hæmorrhage from minute vessels associated with deep and long-continued jaundice. The second died of uncontrollable vomiting on the fourth day and at a secondary operation no abnormality or cause of death was demonstrable. These accidents are features of the conditions present at operation regardless of the special form of procedure and therefore are not rightly chargeable to duodenocholedochotomy. Besides the death mentioned above, in which a fistula was conspicuous, Robson²⁸ has had a death-case, No. 243, following the operation due to a subdiaphragmatic abscess overlooked at both operations. Nothing in connection with the operative field was found post-mortem to be abnormal. Another case died of heart failure from presence of acute dilatation of the stomach, nothing else being found to account for the death. It appears from the records, then, that one death with fistula and one case with temporary fistula may fairly be cited, to the discredit of the operation. In view of this it hardly can be said that duodenocholedochotomy is extra hazardous. It has participated *pari passu* in the benefits of accumulated experience and improved technique which have accrued to this field from the vast amount of work done in the last few years. A point worthy of consideration, too, in comparing supra- and

transduodenal mortality, is that other things being equal a stone impacted in the diverticulum or papilla of Vater represents on the average a later period in the disease process, and hence greater danger from local injuries to the parts and systemic effects of chronic jaundice and infection

The other operations calculated to accomplish the purpose of duodenocholedochotomy are the usual supraduodenal operation and retroduodenal choledochotomy. The former fails to be effective in just the class of cases for which the transduodenal operation was primarily intended, and offers, besides, no real diminution of risk. It is advantageous in some cases to perform both where stones are distributed along the common duct and finish by drawing gauze strips from the upper opening through the duct to sweep it clean. As a substitute for the transduodenal route the operation of retroduodenal-choledochotomy has been proposed and performed. Berg,²⁹ basing his views on dissecting-room work, has found with Brewer³⁰ under like conditions difficulty in finding the papilla.

The fallacy of drawing conclusions from comparisons between anatomical and pathological conditions has already been mentioned. Berg also claims the initial though slight danger of immediate peritoneal infection and that of a subsequent duodenal fistula as objections to the transduodenal route. Quervain³¹ gives a summary of the work done along this line and reports a case. The first step in this procedure was taken by Lane³² when he freed the upper part of the duodenum behind for purposes of investigation, but removed the stone by supra-duodenal-choledochotomy. Later, Kocher³³ endeavored to displace the duodenum to one side to reach the posterior wall, but on account of hæmorrhage from the pancreas changed to the transduodenal route. Jeantry³⁴ reports three cases performed by Monprofit. Some few others have performed operations which seem to have been along this line. After describing his own case, he sums up the situation by saying that the retroduodenal route is indicated in cases in which the duodenum may be freed in a clear, trim (Sauber) way. Where the duodenum, common duct, and pancreas are

matted together by adhesions, and one runs the risk, in separating the same, of injuring the walls of the gut, or starting hæmorrhage, in spite of care, one would do better to proceed by the transduodenal route. From a study of the anatomy of the pancreas and its relations to the duodenum and common duct especially as brought out by Robson³⁵ it would seem clear that this route would frequently on anatomical grounds alone not be available. Furthermore, the difficulty and time involved at the start in freeing the duodenum behind while working, as one must, at the bottom of a deep cavity will hardly appeal to one as advantages compared to the freedom and speed of the transduodenal route with the parts elevated well into the field of operation. Furthermore, additional time will be consumed in any attempt to replace the duodenum in its original position after extraction of the stone. Finally, there is a condition, an instance of which has recently come under the notice of the author, in which neither of these procedures would have been adequate, while Kocher's trans-duodenal-choledochotomy would have answered very well. I refer to a case with a stone the size of an olive low down in the common duct, a gall-bladder the size of a hazel-nut, absolute stenosis of papillary orifice, and a history of jaundice of fifteen months' standing with numerous ague-like attacks of fever, etc. The patient died from capillary and venous hæmorrhage from broken up adhesions and in spite of calcium chloride, etc. Post-mortem, it was clear that (1) retro-duodenal-choledochotomy would have been impracticable from the comprehensive manner in which the head of the pancreas embraced the junction of the common duct with the duodenum, (2) supra-duodenal-choledocotomy would have been but a preliminary step to a secondary choledochoduodenostomy, and (3) Kocher's trans-duodenal-choledochotomy with subsequent anastomoses using the same incision in duct and gut would have accomplished the choledochoduodenostomy in the easiest and quickest way.

A brief account of the author's case is as follows

E M B, female, forty-six years old, had a primary chole-

cystotomy at my hands, January 10, 1903, whereby seventy-odd stones were removed. The fistula closed in five (5) weeks with an uninterrupted recovery except for slight return of nausea and vomiting, and colicky pains on the eleventh (11) and twenty-third (23) days respectively after operation. April 3, 1903, I was called to see the patient again and found her suffering with a severe attack of biliary colic. This time there was a slight but distinct trace of jaundice. Patient was removed to the hospital and operated on the same day. On opening the abdomen, it was interesting to notice the absence of adhesions except for one small band connecting the fundus of the gall-bladder with the peritoneum of the abdominal wall where it had been sewed at the first operation. Examination showed one small stone in the gall-bladder and another stone in the common duct where the latter passes through the duodenal wall. Several endeavors to pass the stone into the duodenum or up into the free part of the common duct were unsuccessful, although the stone was susceptible of slight movement, ball-valve stone of Fenger. It became clear the simplest and quickest way for removal was by the duodenum. Securing the stone firmly in the fingers of the left hand, and thus establishing a fixed point, the wall of the duodenum was incised on its antero-external aspect. The papilla was easily dilated and the stone removed. I then sounded carefully from below and found no more stones in the common or hepatic ducts, and closed the duodenum after satisfying myself that there was a free flow of bile at the outlet of the common duct. I suspected the gall-bladder of having contributed the offending stone, and having more in the cystic duct besides the one readily felt at the fundus. I concluded, in view of its contracted and thickened walls and the stones to remove it. Tying the cystic duct where it joins the hepatic, I dissected the mass from the liver. The slight hæmorrhage was controlled by gauze packing, while gauze drains were placed to the wound in the duodenum and stump of the cystic duct. After four days of rectal feeding oral feeding was begun. The dressing was done the fourth day for the first time, and the wound healed kindly and closed the thirty-fourth (34) day. On the thirtieth (30) day after operation the patient menstruated, and during the menstrual period suffered with vertigo, headache, nausea, and vomiting. The vomitus contained bile, showing the

duct to be patent. Now, more than two (2) years later, patient reports herself as well and free from symptoms. On examination the bladder and cystic were found to contain many small stones, those in the duct being so distributed in folds and pockets as to obliterate the lumen of the duct.

Summing up the points for and against the transduodenal route it will be convenient to consider the question of neoplasm of the papilla and pancreatic calculi as well as gall-stone for the reason that a fine discrimination in diagnosis is often impossible in this class of cases.

(1) In favor of duodenocholedochotomy for gall-stones in the lower end of the common duct are (a) the avoidance of drainage in some cases where one would not otherwise wish to sew up the wound in the duct and close the abdomen, (b) the greater ease in sewing the duodenal than the duct incision by virtue of size and proximity of the former, (c) uniformly kindly healing of intestinal wounds, (d) easy and natural access to common duct, (e) ease and benefit of dilatation of papillary orifice in ensuring better drainage of bile and detritus, (f) duct may be safely incised for half an inch in extracting stone or in enlarging the orifice for drainage. Against the procedure has been raised the common prejudice against opening gut in general, the fear of fistula which occurred in but two out of sixty-two cases, and the dread of infection which, as indicated above, has been vastly overrated in regard to the upper half of the intestines.

(2) In neoplasm of the papilla this route is clearly indicated for diagnosis and treatment where the growth is amenable to local treatment and the gall-bladder cannot be used for anastomosis or drainage.

(3) In total stenosis of the papillary orifice, whether from neoplasm or trauma of stones, a choledochoduodenostomy could be done with the incision employed in duodenocholedochotomy, where the anastomosis could be made low down in the common duct.

(4) In pancreatic stone, duodeno-pancreo-lithotomy is an

established procedure and for good anatomical reason is the method of election

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CONSTRICTION OF THE DUODENUM BELOW THE ENTRANCE OF THE COMMON DUCT AND ITS RELATION TO DISEASE¹

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SEVERAL years ago my attention was first directed to an interesting condition which is frequently present in patients which come under my observation during gall-bladder and stomach operations

In many of these cases the duodenum is distended with gas to a point just below the entrance of the common duct,

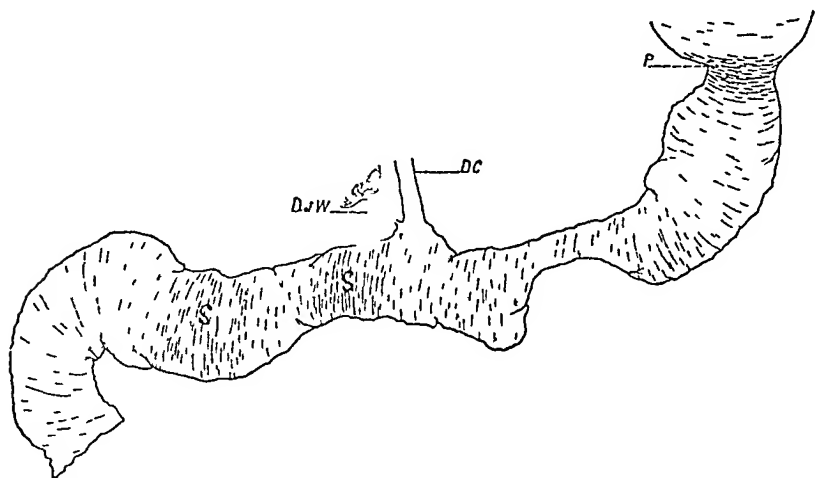


FIG 1—P, pylorus DC, common duct, D of W, duct of Wirsung, S, a double sphincter

while below this it is contracted, and upon raising the transverse colon and finding the origin of the jejunum, this portion of the intestine will also be found in a contracted condition

In looking over authorities upon the subject of anatomy, I found that they all state that the third portion of the duodenum is the narrowest part of this intestine if they make any statement upon the subject They also state that the first portion of the duodenum is usually found stained with bile after death

¹ Read before the American Surgical Association, July, 1905

Several further clinical observations pointed in the same direction

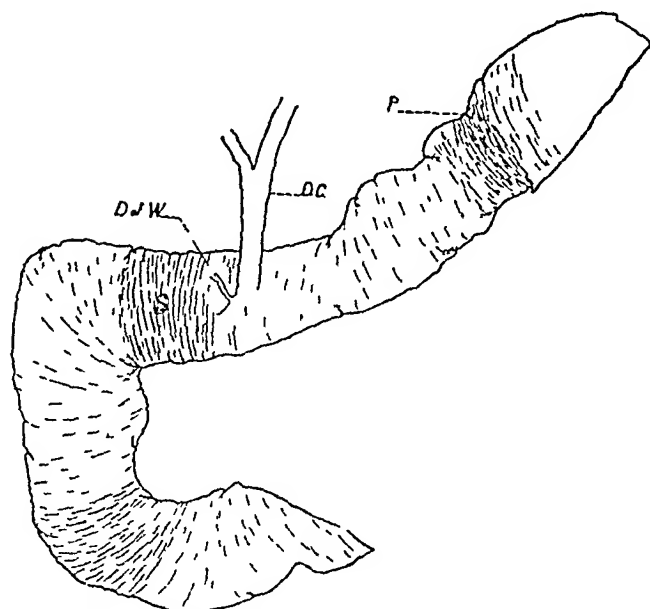


FIG 2—*P*, pylorus, *DC*, common duct, *D of W*, duct of Wirsung, *S*, sphincter below common duct

It was found that the dilatation of the upper portion of the duodenum was most commonly present in patients suffering from chronic cholecystitis with sand or gall-stones in the

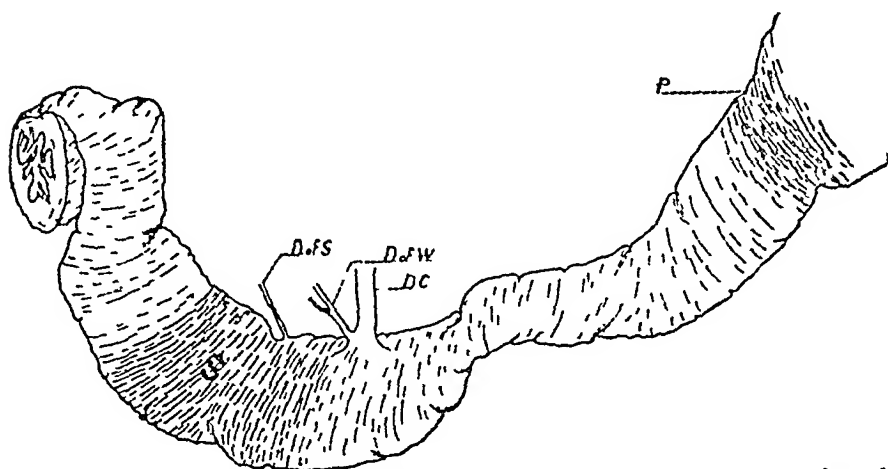


FIG 3—*P*, pylorus, *DC*, common duct, *D of W*, duct of Wirsung, *D of S*, duct of Santorini, *S*, sphincter below entrance of common duct

gall-bladder In these cases there was frequently a more or less marked enlargement of the pancreas

In having the vomitus examined systematically for a con-

siderable period of time in patients who had been subjected to general anæsthesia for operation, it was found that the vomitus invariably contained bile, showing that there must be some reason why this fluid should be forced upward past the pyloric sphincter rather than downward through the small intestine

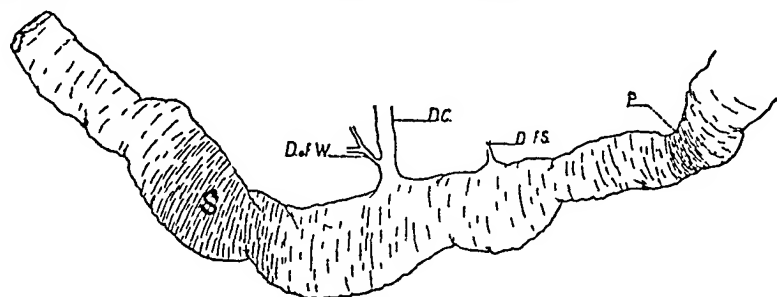


FIG 4—*P*, pylorus, *DC*, common duct, *D of W*, duct of Wirsung, *D of S*, duct of Santorini, *S*, sphincter below entrance of common duct

Again, it was found that in patients suffering from acute gall-stone colic, the spasmodic pain would subside invariably within a few hours upon making careful gastric lavage and prohibiting the introduction of any kind of food into the stom-

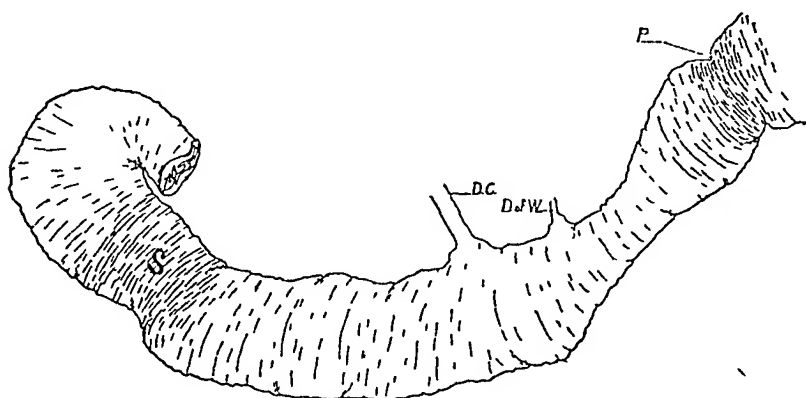


FIG 5—*P*, pylorus, *DC*, common duct, *D of W*, duct of Wirsung, $2\frac{1}{2}$ centimetres from *CD* towards *P*, *S*, point of greatest development of circular muscle fibres 10 centimetres below the entrance of the common duct

ach, although without this aid large doses of morphine, given hypodermically, had given at best only temporary relief in these cases

This seemed to indicate that there must be some point near the entrance of the common duct into the duodenum which regulates the passage of food through this intestine

Since making these observations, the beautiful experiments of Dr Cannon, and more recently those of Cannon and Blake (*ANNALS OF SURGERY*, May, 1905) have added another

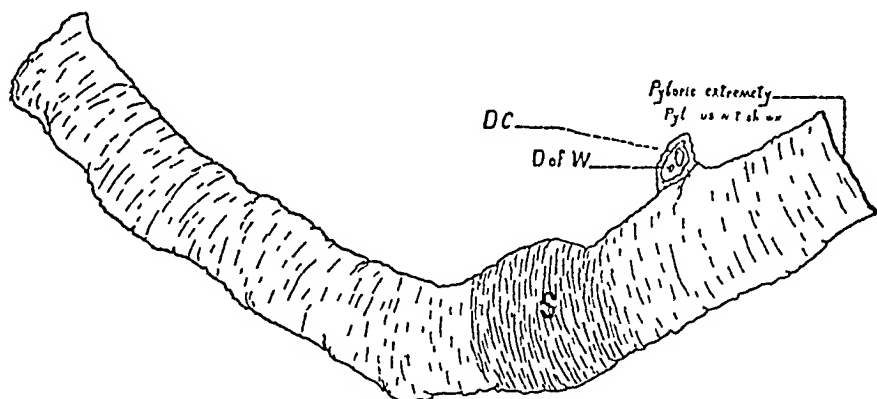


FIG 6—*DC*, common duct, *D of W*, duct of Wirsung, *S*, sphincter below entrance of common duct

fact in the same direction by demonstrating that there is a distinct mixing process which takes place in the upper portion of the duodenum

These clinical observations have induced me to make a

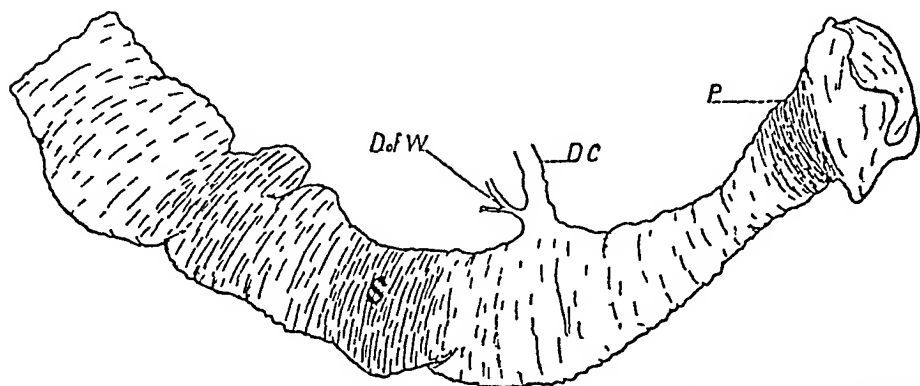


FIG 7—*P*, pylorus, *DC*, common duct, *D of W*, duct of Wirsung, *S*, point of greatest development of circular muscle fibres

careful anatomical study of this portion of the small intestine, both in the living patient and in the cadaver

My assistant, Mr E W Thuerer, has dissected ten specimens, and has made accurate full-size tracings of the duodenum in each of these cases. He has further confirmed our observation by inspecting the duodenum in all cadavers dissected in the Medical Department of the University of Illinois during the past winter

These specimens show a marked uniformity in several directions, as will be seen at once from the drawings

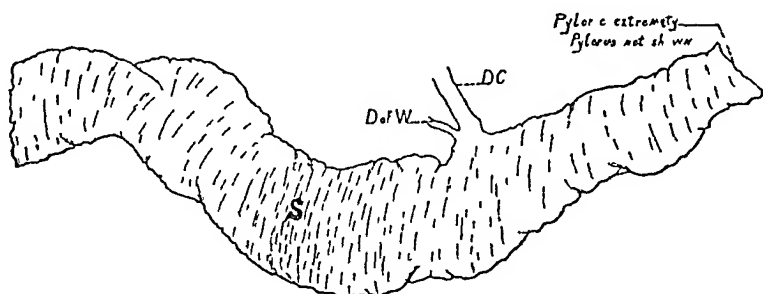


FIG 8—*DC*, common duct, *D of W*, duct of Wirsung, *S*, point of greatest development of circular muscle fibres

In all of these specimens there is a greater or less degree of narrowing between the pylorus and the entrance of the common duct, this can also be seen perfectly in the speci-

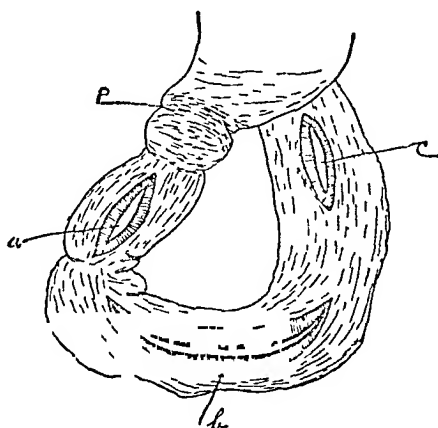


FIG 9—*P*, pylorus The longitudinal incisions *a*, *b*, and *c* show the relative thickness of the circular muscle fibres, (*a*) between the pylorus and the point of entrance of the common duct, (*b*) at the point of greatest thickness 4 centimetres below the common duct, and (*c*) at the point of the duodenum 15 centimetres below this point

mens at the present time, although their immersion in preserving fluid has, of course, brought about some changes

In all of these specimens there is also a more or less marked thickening of the intestinal wall at a point 2 to 4 centimetres below the entrance of the common duct, and a careful study of this thickening demonstrates the presence of a marked increase in the circular muscle fibres, as is shown by

the accompanying microscopic sections taken from various portions of the intestinal wall as compared with this portion of the wall

The arrangement of these circular muscle fibres would remind one very forcibly of the arrangement in the pylorus, although the fibres are much more diffuse, making a broad sphincter

It seems as though all of these facts pointed towards the presence of a sphincter at this point whose physiological function would consist in providing for a means of retaining the

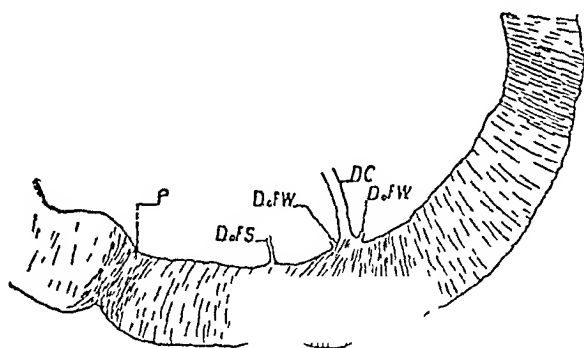


FIG 10—*P*, pylorus, *D of S*, duct of Santorini, *D of W*, duct of Wirsung, double in this case. The circular muscle fibres arranged obliquely, there being a sphincter like arrangement directly opposite the entrance of the common duct

chyme in the upper portion of the duodenum sufficiently long to provide for a thorough mixing with bile and pancreatic fluid, just as the pylorus serves the purpose of retaining the stomach contents, and the ileocaecal valve of retaining the contents of the small intestines

We have long known that under certain pathological conditions the obstruction offered by the pylorus is increased far beyond the normal

We also know that the passage of intestinal contents and gas is obstructed to a marked extent as the ileocaecal valve in case of inflammation in this vicinity, which is of course, usually due to appendicitis, and it has seemed to me as though the above facts would indicate that under certain forms of irritation or inflammation of the gall-bladder or ducts, this duodenal sphincter had taken up a similar action, which would have to be considered physiological in character

No	Hosp No	Sex and Age	Occupation and Nativity	Past History and Family	Condition	Character	Complications	Examination	Condition at Operation
1	15342	F 39	House keeping, U S	Unimportant ?	Gastro enterostomy, gastric ulcer, cholecystitis	Epigastric pain, vomiting, hæmatemesis six years	Appendicitis 2 years ago appendectomy 2 years ago relief for 1 year and then recurrence of symptoms	Epigastric tenderness gastric ulcer, stomach not dilated	Posterior surface near pylorus, gaping pylorus, duodenum distended gall bladder enlarged sacculated, and contained dark, sandy bile no stones
2	15346	F 40	House wife, U S	Unimportant ?	Gastric ulcer, chronic appendicitis, gastro enterostomy, appendectomy	Epigastric pain and gastric distress seldom vomiting blood	None	Epigastric tenderness stomach dilated emaciated and anæmic	Scar of old ulcer on anterior surface of pylorus lymph glands enlarged, pylorus open 6½ centimetres appendix walls thickened gall bladder and pancreas normal
3	15598	M 49	Farmer, Sweden	Liver trouble cholecystitis ?	Gastric ulcer, cholecystitis, gastro enterostomy, cholecystostomy	Right hypochondriac pain and constipation ten years vomiting first three months no blood colicky pain in inguinal region	Neurosis	Tenderness beneath right costal margin and in right inguinal region	Scar on posterior surface of pylorus, which is contracted and on jejunum gall bladder sacculated distended with dark, sandy bile appendix normal
4	15635	F 34	House wife, Sweden	Neurotic ?	Ulcer duodenum, gastritis, lacerated perineum, gastro enterostomy	Vomiting and head aches	Neurosis with enteroptosis	Thin, anæmic no marked abdominal tenderness	Stomach and duodenum dilated lymphatics enlarged appendix and gall bladder normal
5	14254	F 29	U S	Unimportant ?	Cholecystitis, pancreatitis, gastritis, gastrectomy, appendicitis, cholecystostomy, appendectomy	Gastric distress after eating intermittent attacks of vomiting no hæmatemesis	None	Epigastric tenderness emaciation and anæmic anorexia	Duodenum as large as stomach as far as common duct, where it is adherent to enlarged pancreas and constricted appendix cicatricial duodenum adherent to liver
6	14427	F 24	Denmark	Unimportant ?	Gall stones, chronic appendicitis, cholecystostomy, appendectomy	Epigastric, right hypochondriac and right inguinal pains now seen, vomiting jaundice no hæmatemesis	None	Tenderness beneath right costal arch poorly nourished and anæmic	Duodenum enlarged, ducts free cystic duct dilated gall bladder contains stone black sandy bile numerous stones and shreds of tissues

7	14580	F 48	House wife, Sweden	Erythroid at 21 years	Cholecystitis, gastritis, appendicitis, cholecystostomy, appendectomy	Appendicitis attack 6 years for 2 years epigastric pains, radiating to right side and back vomiting	None	Tenderness over McBurney's point beneath the right costal margin and over the middle epigastrium fairly well nourished, but anæmic	Stomach and duodenum down to point opposite papilla dilated omentum adherent to thickened gall bladder, which contained dark bile
8	14603	F 53	Housewife U S	Recurrent attack of gastritis 18 years One sister died, ulcerated stomach	Gall stones, gastritis, pancreatitis, appendectomy cholecystostomy	Epigastric pain after eating lasts 1 hour never vomits	None	Tenderness marked over Robson point poorly nourished and anæmic	Stomach and duodenum down to point opposite papilla dilated pancreas enlarged common and cystic ducts contain stones chronic appendicitis
9	14638	F 51	House wife, Sweden	Typhoid at 18 years 2 brothers died of gastric trouble cancer	Cholecystitis, pancreatitis, cholecystostomy	Hypochondriac pain seldom vomiting tenderness	Epilepsy	Tenderness in both upper abdominal quadrants	Duodenum dilated down to papilla pancreas enlarged and hard gall bladder enlarged, walls thickened, contains tarry bile
10	14666	F 31	House wife, U S	Recurrent attack of stomach Unimpaired	Cholecystitis, pancreatitis, cholecystostomy	Recurring attacks of epigastric pain, gastric distress, vomiting and jaundice	None	Well nourished tenderness beneath the right costal margin	Duodenum dilated gall bladder contained tarry bile appendix distended
11	14728	F 68	House wife, German	?	Cholecystitis, pancreatitis, appendicitis, cholecystostomy	Hypochondriac pain vomiting	None	Emaciated, anæmic epigastric tenderness	Duodenum greatly distended gall bladder contained black sandy bile
12	14787	F 58	House wife, Sweden	Chlorosis at 16 years	Cholecystitis, pancreatitis, cholecystostomy	Constipation about 2 years	None	Emaciated anæmic	Duodenum dilated, pancreas enlarged gall bladder contained tarry bile
13	15443	M 39	Machinist, German	Typhoid in boyhood	Gall stones, cholecystostomy, pancreatitis, appendectomy	Recurrent attacks of epigastric pain with vomiting jaundice at times	None	Tenderness above McBurney's point and just above the umbilicus	Duodenum dilated, pancreas enlarged cholelithiasis cholecystitis, chronic appendicitis
14	15689	F 48	Housewife, Sweden	Unimpaired Unimpaired	Gall stones, pancreatitis, cholecystostomy	Recurrent attacks of epigastric pain and vomiting no jaundice	None	Epigastric and hypochondriac tenderness well nourished	Stomach and duodenum dilated pylorus normal gall stones, cholecystitis, pancreatitis dark, sandy bile

AN ANOMALY OF THE DUODENUM RESULTING IN DEATH AFTER GASTRO-ENTEROSTOMY

BY JAMES G MUMFORD, M D,

OF BOSTON, MASS,

Visiting Surgeon to the Massachusetts General Hospital

SURGEONS have come to think that the causes of death following gastro-enterostomy are (1) a failure of union at the site of anastomosis, with consequent peritonitis, (2) vicious circle vomiting, (3) shock, and (4) pneumonia. I am recording this case because it presents a fifth cause, a preventable cause, an abnormally short duodenum rendering inadequate and dangerous the operation of posterior gastro-enterostomy with the short loop in those cases associated with an immobilized but greatly distended stomach. So far as I know, no similar case has been reported, and the condition is somewhat rare, but it is important and interesting.

The patient's history is commonplace enough. He was a young man of twenty-nine, a motorman, who had suffered severely with gastric symptoms for five years. It was obvious that he had a greatly dilated stomach, the lower border being two inches below the umbilicus, while there was no apparent ptosis, the upper border not being visibly out of the normal position. An immovable mass, about the size of a pigeon's egg, could be felt in what was thought to be the pyloric region. It was assumed that this mass was inflammatory, and a drainage operation was advised.

Accordingly, on July 8, I opened the abdomen, and found the anticipated conditions. Fig 1 shows them fairly well. A large part of the pyloric portion was greatly thickened, and was held up to the liver by strong and dense adhesions. No enlarged mesenteric glands were found. So the pyloric portion, owing to its great and extensive thickening, entered but little into the dilatation, which was composed of the thinned and ballooned fundus.

On turning up the omentum, colon, and stomach, and search-

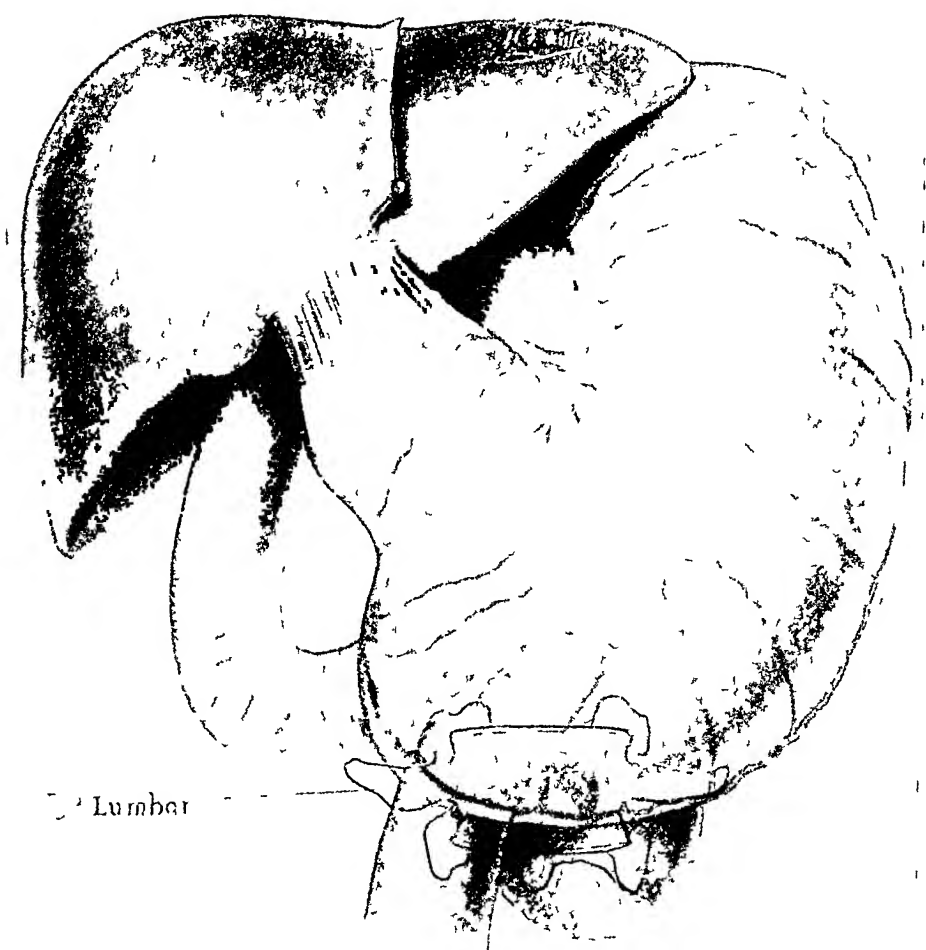


FIG 1

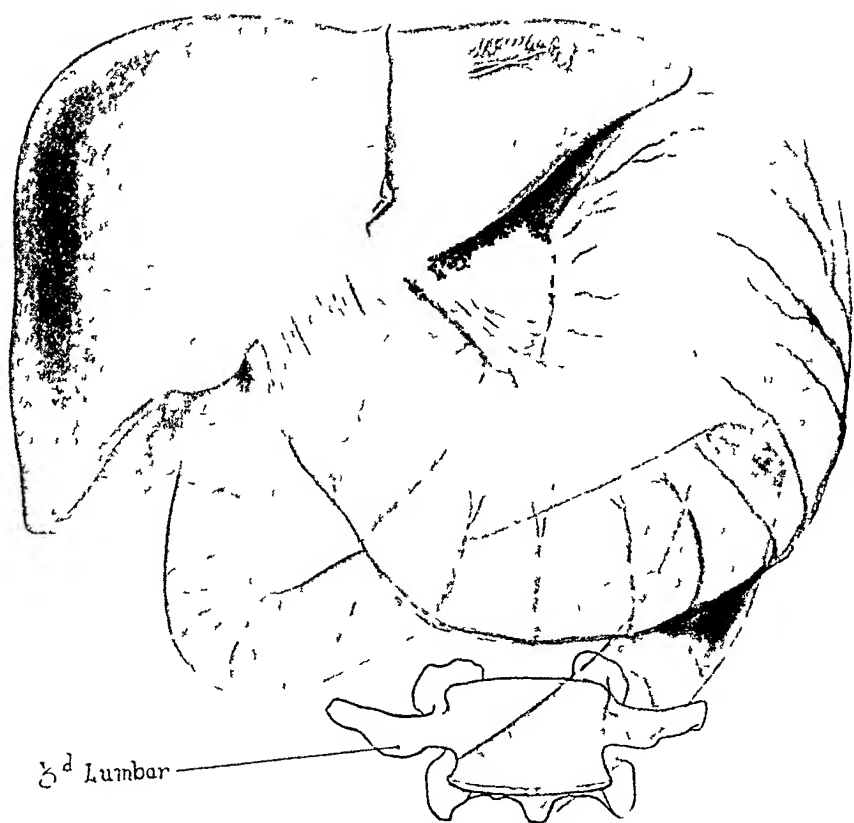


FIG 2

ing for the jejunum, I found that that portion of the gut did not spring from a ligament of Treitz upon the left crus of the diaphragm, but from the right crus. In other words, the fixed duodenum ended upon the right of the spinal column. I thought little of this at the time, and merely mentioned it as an interesting anomaly to my little audience. I had intended to do Finney's pyloroplasty, but, as the conditions were unsuitable, I proceeded with the familiar short-loop posterior gastro-enterostomy. The opening in the stomach was made as near the pylorus as I dared to place it, in view of the thickened and friable condition of the gastric wall at that portion. The opening in the jejunum was made about three inches from the ligament of Treitz, the fixed portion of the intestine. In other words, the play allowed to the movable stomach and jejunum was to be limited by the short radius—ligament of Treitz to anastomotic opening—afforded by the three-inch limb of jejunum, and in this patient's case the centre from which the radius sprung was upon the right of the spinal column. The anastomosis was made by stitching, without other mechanical device, and, at the end, the technique seemed to be satisfactory.

The patient bore the operation extremely well, and assured me, the next morning, that he had not felt so comfortable for years. Promptly his appetite returned, his bowels acted well, and the quality of his diet was changed from day to day as his keenness for food increased. All went satisfactorily until the fifth day. That morning he complained of some slight epigastric uneasiness, and was immediately put upon a liquid diet with bicarbonate of soda. Nothing more was heard from him until midnight, when he underwent a sudden and violent paroxysm of severe abdominal pain, associated with profound and alarming collapse. Morphia did not quiet him, and the house-surgeon was obliged to use ether. Thus the patient continued until ten o'clock the next morning (ten hours), when he died.

This catastrophe was not clearly explicable until the autopsy, when an interesting and significant situation was revealed. The abdominal cavity was found flooded with gastric contents. On exploring carefully the stomach, which appeared contracted nearly to the normal size, a large rent was found far to the left, in the fundus of the stomach. At first it was thought that this must be

the perforation of an ulcer, undetected at the operation. It did not seem probable that the anastomotic stoma could be so far from the pylorus, but on farther investigation this rent was found to be the stoma with a portion of the torn-off jejunum attached to its right-hand border. The short arm of this portion of jejunum ran to the ligament of Treitz. It was on the stretch and measured four inches from the stoma to the ligament. Fig 2 illustrates this appearance.

A little reflection served to explain the rather surprising new arrangement of the parts, and to show what had been going on inside the unfortunate man's abdomen. So long as the stomach remained dilated, the new stoma and the efferent and afferent loops lay in easy relation, and performed their functions. With drainage and rest, however, the overdilended stomach fundus retracted towards a normal position and size. As it retracted it stretched and gradually dragged the afferent loop towards the left, until that portion of the bowel found itself drawn tightly between its fixed point, the ligament of Treitz, and its retracting point, the gastro-intestinal stoma. It gave way accordingly at its new attachment, with a result fatal to the patient. In such a case as this, it is a lamentable reflection that the more perfect the artificial stomach drainage so much the more rapid is the stomach retraction, and so much the earlier is the fatal result. In another similar case I should perform posterior gastro-enterostomy and entero-enterostomy with section of the afferent loop between the two anastomotic openings.

Unfortunately for surgeons, anomalies of the third and fourth portions of the duodenum are not so rare as many standard text-books state. Quain and Gray hold that the fourth portion ends on the left of the aorta, but recent studies show that statement to be incorrect frequently.

Several years ago, Professor Thomas Dwight tabulated the results of his observations on the duodena of *fifty-four* adults (*Journal of Anatomy and Physiology*, vol xxxi, page 516). His findings are so strikingly at variance with the common teaching, and are so important withal, that I quote the following paragraph:

"The usual statement that the third part (of the duode-

num) crosses the aorta, presumably with no peritoneum intervening, and that the fourth ascends on its left, is incorrect. Jonnesco admits that this last part is much less firmly attached than the second and third, so that it slides easily. He states that when the fourth part ascends vertically it lies on the lower third or quarter of the left kidney. In point of fact, it is only exceptionally that the fourth part is prærenal at all. In the fifty-four cases already mentioned, the duodenum was on the right of the aorta, till just before the terminal flexure, twenty-six times. It was wholly on the right six times. The fourth part lay in front of the aorta eleven times, and the third part actually crossed the aorta eleven times."

In other words, from a study of Professor Dwight's paper, it appears that that rather indefinite structure, the ligament of Treitz, may lie in front of the spinal column or even slightly to its right in from 10 to 12 per cent of adult cases, a fact noteworthy to surgeons, especially in view of the case I have reported here.

RESECTION OF INTESTINE, FOLLOWED BY END-TO-END ANASTOMOSIS¹

REPORT OF CASES WITH REMARKS

BY ELLSWORTH ELIOT, JR., M D

OF NEW YORK

Surgeon to the Presbyterian Hospital

THE indications for resection of some part of the small or large intestine are well defined. Of the more frequent acute conditions may be mentioned the different varieties of gangrene, extensive damage to a loop of intestine through penetrating wounds, especially gun-shot wounds, and the destruction of its blood-supply through traumatic separation of its mesenteric attachment, or through the division of one of the terminal branches of a mesenteric artery.

Of the sub-acute or chronic conditions may be mentioned intestinal fistulæ that do not yield to less stringent measures, chronic obstruction in which coils of intestine are so firmly bound together that their successful separation is impossible and chronic benign strictures, including the tubercular and the rare syphilitic varieties, especially if associated with intractable ulceration and cancer above the level of the sigmoido-rectal junction.

The clinical features of the acute conditions are so well understood that no special description of them is necessary. On the other hand, the clinical development of those chronic conditions not associated with external or visible change in the abdominal wall, especially of those causing stricture, is so varied and frequently so insidious that early diagnosis is impossible.

In benign stricture a tardy diagnosis does not necessarily affect adversely the chances of permanent relief through some surgical operation, on the other hand, inability to make an early diagnosis in malignant stricture diminishes greatly the chance of successful removal, and even in those occasional cases

¹ Read at the meeting of the New York Surgical Society, October 25, 1905

in which resection is possible subsequent recurrence is greatly to be feared

One of the greatest needs in surgery to-day is the discovery of some method by which malignant disease of internal organs can be detected in its incipient stages, and especially is this true of the organs of the abdominal cavity, for, not only in the intestine, but in the stomach and uterus as well, malignant disease, when its initial symptoms appear, is frequently beyond the possibility of successful cure. For this reason the early manifestations of malignant stricture of the colon should receive most careful consideration and analysis, although any considerable progress in facility of diagnosis can scarcely be achieved, for, in the first place, accurate diagnosis is frequently impossible because of the paucity of the symptoms. Thus, in some cases after a long period of uninterrupted health, the patient suddenly develops the symptoms of acute or subacute obstruction, and subsequent operation discovers a growth that must have existed for years. In the second place, even when early symptoms develop, a wide variation is seen to exist. Thus, in many, disturbances of digestion and increasing difficulty in the passage of the intestinal contents may attract attention. Under this general head, may be mentioned nausea and loss of appetite, the persistent fermentation and gas-production leading to a sense of fulness referred to some particular region in the abdomen—a feeling usually most marked from four or five hours after eating, according to the distance from the stomach to the stricture, the discomfort and occasionally, later, the actual pain, as the intestine above the point of stricture becomes more distended, the subjective sensation of relief due to the passage of the accumulated gas through the narrowed lumen below often accompanied by a marked gurgle. Such a train of symptoms should lead in every instance to repeated careful palpation of the abdomen and in doubtful cases to early exploration particularly where unusual thickness of the abdominal wall might conceal a growth of small size or where the growth lies in some deeper inaccessible part of the abdomen or pelvis.

In other cases, constipation may be the first symptom. Regularly it should follow the group of symptoms just enumerated. After it has once appeared, it is more marked at those

times when, through the swelling of temporary congestion, the orifice of the stricture is suddenly greatly diminished. With the subsidence of congestion, constipation disappears, it is therefore an intermittent symptom. Occasionally, after ulceration has occurred, the foul discharge induces catarrhal inflammation of the contiguous intestine and diarrhoea, sometimes with stools containing traces of pus and blood. Hence the "alternating diarrhoea and constipation" of which some authors write and which is actually an exceptional and sometimes misleading symptom, for the growth is almost always scirrhous and the resulting ulceration occurs not only at a later period but also with a discharge that is much less irritating than in the other varieties of carcinoma.

The initial appearance of constipation depends not only upon the degree of stricture but also upon its proximity to the rectum, due to the solidification of the fecal current in the lower part of the large intestine. In the sigmoid flexure, therefore, constipation is more likely to develop at an earlier period than in the upper part of the large intestine. But irrespective of the situation of the growth, constipation with subsequent obstruction develops only when the growth encroaches upon the lumen of the gut. Frequently the colon is involved with little or no diminution of its calibre and constipation is absent throughout.

Finally, in the absence of all previous symptoms, as has already been mentioned, the symptoms of sub-acute or acute obstruction may be the first indication of the presence of the growth.

The objective symptoms which need no special description are those of a tumor with or without an associated ascites and with, later on, the appearance of metastases in the liver and other parts of the body. Ordinarily this tumor cannot be felt for some time after the development of the initial subjective symptoms and even in the later stages it may, as has been stated, be concealed by a thick abdominal wall, the presence of moderate distension, or by the fact that it occupies a position inaccessible to palpation behind some viscus or below the brim of the pelvis. In the latter situation, as in Case IV, it may be felt by rectal examination.

It is also important to note that even under favorable

conditions, a most careful examination may fail to detect the growth a day or two after its successful palpation near the anterior abdominal wall (as in Case III, prior to operation) and also the fact that it may be felt in different parts of the abdomen in successive examinations. Both of these last mentioned variations are most likely to occur in growths that involve any portion of the alimentary canal that is provided with a mesentery and that have not as yet become adherent to immovable parts (in Case III, the ileum, in Case IV, the sigmoid). In the transverse colon a similar degree of mobility might be enjoyed, but in the four ascending or descending colons growths could possess at the very best only a slight range of movement.

The indications for resection in the treatment of stricture admit of little if any discussion. On the other hand, the means by which the patency of the canal shall be re-established vary greatly. Each particular method and each almost unending modification of that method have their adherents, and the investigator who endeavors to unravel the much-vaunted advantages of this or that proceeding encounters a confusing mass of incompatibilities and contradictions.

It is not the intention of the writer to discuss the comparative value of end-to-end, end-to-side, and side-to-side, methods of anastomosis, nor whether anastomosis is preferably accomplished by suture alone or with the aid of some artificial appliance. Much depends upon the condition of the resected ends as well as upon the general condition of the patient, which may be such as to demand the greatest speed. If no special hurry is necessary and if the resected extremities are of equal calibre and of normal appearance and consistency, it is the writer's opinion that any one of several methods will yield satisfactory results, preference being naturally given to that one to which the operator is accustomed. The method of end-to-end anastomosis, of which a brief description follows, is therefore not introduced by the writer as one necessarily superior to those in general use, but merely as one that has given satisfactory results, and seems, in the few cases reported, to have protected the patient from the dangers of a perforative peritonitis.

After the removal of the damaged or diseased intestine

and after the exposed ends have been prepared for suture in the usual way, those portions of the circumference included between the layers of the mesentery are carefully united with two or three interrupted sutures of chromic gut. In the small intestine, where this interval is narrow, one or two are sufficient, in the large intestine, where this interval is much wider, three or even four may be used.

Advancing then to either side alternately of the mesenteric attachment, similar sutures are passed between all the layers of the wall of the intestine except the serous coat and tied (with the exception of the last two or three) from within. In the process of repair, therefore, this first row of sutures should be discharged into the lumen of the gut. A second row of interrupted Lembert silk sutures is now passed around from one side of the mesenteric attachment to the other, the first and last sutures being inserted respectively on either side close to the junction of the mesentery and intestine.

If the sutured ends of the intestine are of normal appearance and free from congestion, the abdominal wound is then closed without further precaution or drainage, except in the sigmoid flexure, where a small cigarette drain may be passed down to the sutured gut. If, on the other hand, either of the resected ends is unduly congested, or friable, or of unequal size, even although the viability is unquestioned, the sutured loop may be fastened to the anterior parietal peritoneum by one or two plain cat-gut sutures and a small drain of gauze inserted on either side. In this way, subsequent leakage which under these circumstances is extremely likely to take place, may be conducted into the dressing, thus obviating the danger of a peritonitis.

In the sigmoid the integrity of the suture line from the distension of the upper segment with either gas or feces may be protected by insertion through the rectum to a point beyond the line of suture, of a rubber tube. This should be introduced by an assistant and guided by the surgeon's finger in the abdominal cavity to the desired point. The wound is then closed in the usual way, after the insertion of a small cigarette drain.

CASE I—*Strangulated Inguinal Hernia, Necrosis of small Intestines Resection, Recovery*—T. M., male, aged thirty-five years, admitted to the Gouverneur Hospital, June 21, 1903.

Patient had had a reducible oblique inguinal hernia for the past ten years. During the latter part of that time he has had several attacks of acute irreducibility, all of which yielded to taxis and palliative treatment. Yesterday, while engaged in lifting, the hernia again became irreducible, and patient was seized with great pain and vomiting. All attempts at reduction failed.

On examination, there is an irreducible swelling in and occupying the region of the left inguinal canal, which presents all the usual symptoms of a strangulated hernia. The swelling extends a short distance below the external ring into the scrotum.

Operation—Under ether anæsthesia, the hernial sac was exposed by the usual Bassini method. It contained considerable bloody serum, free from odor and a loop of small intestine of dark color and which, although without perforation at the point of constriction, yet was suspiciously flaccid over an area of about two inches in width. It had not yet lost its glistening appearance.

Owing to the doubtful viability of the exposed gut, which after the relief of the constriction (at the internal ring) still retained its dark color and flaccid consistency, its wall was sutured to the margin of the internal ring and a temporary warm dressing was applied. At the end of twenty-four hours, gangrene was established beyond a doubt and resection with end-to-end anastomosis was immediately done. With the completion of the anastomosis, a small wick of gauze was passed down into the abdominal cavity along with the sutured intestine and the remaining part of the wound was closed as far as possible according to the Bassini principle.

At no time during either operation or during the twenty-four hours intervening was the patient's pulse over 100.

Post-operative—There was little if any reaction, the temperature and pulse both remaining below 100. There was instant cessation of vomiting, and in the course of twenty-four hours passage of flatus from the rectum. There was no distention. During the third day discharge of fecal matter appeared in the wound. This became very abundant but did not represent the entire intestinal contents, as the bowels moved regularly after the second day. The color and consistency of the fecal discharge

corresponded to that ordinarily found in the upper part of the small intestine. At the expiration of a week, it had greatly diminished in amount and before the end of the third week had entirely disappeared. At no time was the general condition of the patient materially weakened.

The wound closed rapidly and at the end of the fifth week, the patient left the hospital.

The patient was examined occasionally during the next twelve months, at the end of which time no recurrence had taken place. Owing to the fact that the wound was left open at its inner angle a late recurrence may be expected.

CASE 2—T I, aged forty-seven years, admitted to the Presbyterian Hospital, February 21, 1903. For the past fifteen years, patient has had a reducible right inguinal hernia. During the past five years, the hernia has been satisfactorily held back by a truss. This morning, however, while straining at stool, the hernia became irreducible and painful, slipping down behind the truss. There was some nausea but no vomiting, and the bowels moved to enema freely on both the 21st and 22d.

On examination, there is a right irreducible oblique inguinal hernia, extending down to the testis. There is a distinct expansile impulse on coughing. The swelling, though not painful, is moderately tender. There is slight indefinite pain referred to the lower part of the epigastrium in the middle line. The temperature ranges between 99 and 100, the pulse about 90 to 100.

The foot of the patient's bed was raised by shock blocks and an ice cap applied to the swelling.

February 22 Vomited some broth to-day at noon. No vomiting had occurred at any previous time. Discharge of flatus and a small amount of fecal matter from the bowel. There is more pain and some fulness in the lower part of the epigastrium. On palpation in this region, there is slight tenderness and rigidity.

February 23 Bowels moved to-day with enema. There was one attack of vomiting after taking broth in the morning. There is some restlessness. The hernia is gradually decreasing in size.

February 25 During the night, there was intense abdominal pain with considerable hiccough, interfering with sleep. There was one attack of vomiting during the afternoon and again in the evening. Two movements of the bowels, secured by enema, gave relief. Patient does not look seriously ill.

February 26 A repetition of yesterday Pulse has not been over 88 at any time since admission and the temperature is normal

February 27 Another good result from enema There is still occasional vomiting after taking food

February 28 To-day, for the first time, visible peristalsis appeared in the right iliac fossa with slight distention of the lower part of the abdomen Patient feels cramp-like pains which disappear with inward rumblings of gas There is some rigidity in the lower right quadrant above the situation of the internal ring General condition unchanged

During the next forty-eight hours, the hiccoughing and vomiting became less, but the rigidity and distention continued unabated and the bowels moved with increasing difficulty

Operation—Ether A median incision below the umbilicus was made, and the peritoneal cavity opened There was a small amount of free serous odorless fluid Over toward the right side, in the lower quadrant, the small intestine was congested and swollen and the loops were smeared with fibrine Almost immediately, on the separation of these soft adhesions an abscess cavity was opened, and at the wall of internal ring at a point where it had been constricted by the margin of the interna (an adjacent loop of small intestine) an orifice was seen, through which intestinal contents escaped Another constriction was seen in the loop at a distance of six inches, but this had not given way The damaged loop which was very friable was resected, followed by end-to-end anastomosis, and after the insertion of several small wicks of gauze, the closure of the remaining part of the wound

Post-operative course—Owing to an associated endarteritis, the patient's general condition remained poor for several days, the pulse ranging from 120 to 140, although the temperature was below 100 There was, however, no sign of peritonitis and on the day following operation considerable flatus was expelled through the rectum On the fourth day, after repeated small doses of phosphate of soda, the bowels moved several times On the fifth day after operation, at the time of the second dressing, a slight fecal discharge was noticed On the tenth day, the fecal discharge was quite abundant, but from that time on, rapidly decreased and had entirely disappeared by the 24th day, leaving a healthy granulating surface which slowly cicatrized

On May 8, patient left the hospital, completely healed, having gained between 20 and 30 pounds in weight

On examination one year afterward, the patient's general condition was excellent and there was no recurrence of the hernia

Bacteriological examination of the pus showed the presence of the bacillus coli communis, while that of the excised intestine showed "beginning necrosis"

CASE 3—H K, male, aged sixty years, admitted to the Presbyterian Hospital, May 1, 1903 Patient was always well until seven months ago At that time, without known cause an attack of abdominal pain and vomiting occurred, lasting but a few hours These attacks have recurred every three or four weeks and recently have lasted for a week or ten days with a sense of obstruction to the passage of the intestinal contents Vomiting has always occurred shortly after the taking of food, the vomitus consisting of the contents of the stomach and never containing blood in any form There has been constipation for the past three months, the bowels moving every three days to catharsis

On examination, there is intermittent moderate distention of the central part of the abdomen This usually disappears after a movement of the bowels, and at that time, a small ovoid hard tumor can generally be felt in the right iliac fossa Occasionally no mass can be felt in this situation Examinations of the stomach and rectum negative

Operation—Gas and ether Under ether no tumor could be felt An incision below the level of the umbilicus along the outer margin of the right rectus muscle was made and the peritoneal cavity opened The affected loop of small intestine was easily found directly in front of the promontory of the sacrum within the cavity of the true pelvis and presented a hard nodular tumor, involving its entire circumference, situated about ten inches from the ileo-cæcal junction The lymphatic glands in the adjacent portion of the mesentery were hard and nodular even as far as its vertebral attachment This extensive lymphatic involvement necessitated the removal of about eighteen inches of small intestine An end-to-end anastomosis was then done, and the abdomen closed without drainage

Post-operative—Primary union was secured Flatus was expelled by the rectum and a movement occurred on the first

day after operation Rectal alimentation was carried out for forty-eight hours and then small quantities of peptonized milk were given There was no vomiting or distention at any time after the operation

On gross examination, the tumor appeared to be a scirrhus carcinoma involving the entire circumference of the intestine and diminishing by at least one-half the patency of its lumen On microscopic examination, the tumor proved to be an adenocarcinoma

Six months after the operation, the patient had gained sixty pounds and worked without interruption The bowels were regular and he was free from pain About ten months after operation evidences of recurrence appeared in the liver from which the patient died one year after his discharge from the hospital

CASE 4—J E R, male, aged forty-nine years, referred by Dr Conkey Admitted October 22, 1903 Father died of cancer of intestine With the exception of scarlet fever when a child, an attack of acute articular rheumatism when twenty, and an occasional attack of bronchitis during the winter, patient was always in excellent health until August, 1902, when he first noticed pain in the left side The pain was usually in the vicinity of the anterior superior spine and was of a burning character Occasionally it was so severe as to be scarcely endured The stools were loose and blood-stained and contained shiny matter The patient was treated for hemorrhoids without any local examination being made Since that time, there has been gradual loss of flesh and strength At present, the chief complaints are pain in the left flank, anorexia, general weakness and attacks of diarrhoea with bloody stools

By rectal examination, a mass can be made out high up through the posterior rectal wall, freely movable from side to side On bi-manual examination the same mass can be distinctly outlined in the median line midway between the navel and the umbilicus and is about the size of a small orange, hard and nodular It is freely movable from side to side There is no evidence of hemorrhoids There is no glandular enlargement in any part of the body

Operation—Incision in the median line, four inches in length, above the symphysis pubis On opening the peritoneal cavity

a tumor was found near the centre of the sigmoid, involving its entire circumference for a distance of three inches and being from two to three inches in diameter. It was very hard in consistency, evidently of the scirrhous type and accompanied by glandular involvement in the meso-sigmoid nearly as far as the vertebral column. About seven inches of the sigmoid and a corresponding amount of its mesentery, containing all the involved glands, were removed followed by end-to-end anastomosis. A small cigarette drain was inserted to the point of suture after the return of the intestine and a rubber tube was passed through the rectum to a point beyond the suture line. Closure of the abdominal wall.

Post-operative—Scarcely any vomiting followed the operation. There was little if any reaction and the abdominal wound healed by first intention, the pulse never rising above 100. The drain was withdrawn on the third day and not re-inserted. The bowels moved on the fifth day to small doses of calomel and salts. At the end of the second week patient was placed on regular diet. At the time of discharge, patient says that he is entirely free from the pain of which he complained prior to the operation. The diarrhoea had ceased, the bowels moving regularly with slight discomfort.

Two years after the operation, patient reports that with the exception of occasional constipation, he is perfectly well. The microscopic examination of the growth shows it to be an adenocarcinoma.

Case 5—P. H., aged sixty-five, referred by Dr. Niesley. Admitted to the hospital, February 3, 1904. Wife is said to have died of "cancer." Patient has always enjoyed excellent health. About four weeks ago, patient suffered from an attack of constipation with mild obstructive symptoms, which did not yield readily to catharsis. The last satisfactory movement occurred sixteen days prior to admission and since that time there have been only occasional small movements with the passage of gas after enemata. During this period there has been nausea with occasional vomiting and a variable degree of distention. There has been no loss of flesh and nothing abnormal in the character of the stool.

On examination, there is general endarteritis and moderate distention of the abdomen. No growth can be felt either through the abdominal wall or by rectum.

Operation—Gas and ether A median incision was made above the symphysis pubis and the peritoneal cavity opened. The sigmoid was examined and found in its upper part to be the site of a hard scirrhus growth with beginning glandular involvement. The intestine above the growth was moderately distended and congested. The growth involved the entire circumference of the gut. About four inches of the sigmoid and the contiguous mesentery were removed, followed by end-to-end anastomosis. Owing to the congested condition of the upper end, a small opening was made through its wall after the suture had been completed and a tube introduced toward the descending colon. It was thought that, by this means, the fecal current could be temporarily deflected until the congestion had subsided and the danger of leakage averted. The remainder of the abdominal incision was closed in the usual way.

Post-operative—Patient developed considerable nausea and vomiting immediately after the operation, which, notwithstanding lavage, continued to his death. There was no abdominal pain, no rigidity or distention, and patient had several large soft fecal movements through the rectum within twelve hours after the operation had been concluded. There was no discharge of fecal material through the tube inserted into the descending colon until the second day. Patient died on the third day from heart failure due to the poor condition of his arteries.

Microscopic examination showed the growth to be an adenocarcinoma.

REMARKS ON CASES

CASE I—This case of strangulated hernia is of interest in that the gut, after the constriction was divided, was exposed for 24 hours beneath a temporary dressing before the question of gangrene could be determined. This same procedure was followed in a similar case reported in the Presbyterian Hospital report of 1902, in which the suspicious gut eventually proved viable. The delay in the completion of the operation in both cases did not seem to jeopardize the recovery of the patient.

The development of the fecal fistula was expected and was associated with no general constitutional disturbance. From the nature of the discharge an artificial anus would probably have resulted in the subsequent emaciation and star-

vation of the patient As a matter of fact, the absence of any disturbance of nutrition in the present instance was due to the short duration of the fistula as well as to the fact that, even when at its height, a sufficient amount of intestinal contents passed down the normal channel to form movements of moderate size and frequency

Examination of the affected segment showed a necrosis more advanced in the mucous membrane than in the serous coat The lumen was partially filled with most offensive fluid material

CASE II —The clinical features in this case of strangulated hernia are surely most atypical and unexpected Notwithstanding that the contents of the sac were returned into the abdominal cavity by the gentle pressure of an ice-cap and by the raising of the foot of the bed without taxis or manipulation of any form, the primary constriction had been sufficiently severe to determine the gradual necrosis of the affected loop That this should have taken place without local pain and with the presence of normal expansile impulse, with but slight nausea and attacks of vomiting separated by considerable intervals, with the almost daily movement of the bowels and with the frequent passage of flatus, is certainly most exceptional As, however, the bowel became necrotic, paralysis of its muscle fibre led to the development of the symptoms of sub-acute obstruction At the operation a small abscess was found, moderately circumscribed, containing bacilli coli communis, the result of the perforation which had taken place at one point of the constriction in the affected loop Here again, because of the friable and congested ends of the gut and the presence of an abscess, a fecal fistula developed, but its prompt closure took place as the process of repair by granulation became advanced

CASE III —This case of adeno-carcinoma in the small intestine is of interest because of its rarity and, secondly, because of the resemblance of its clinical features to those occurring in malignant disease of the stomach, the nausea and vomiting occurring regularly within a short time after eating Examination of the stomach contents, however, showed nothing abnormal and physical examination detected the growth in the lower right side of the abdomen, except when it was temporarily absent in the pelvis

The short existence of the symptoms prior to the admission of the patient into the hospital is a forceful illustration of the fact that these growths may reach an advanced stage of development before the first symptoms appear

CASES IV AND V —The clinical features of Cases IV and V are those of more or less typical carcinoma of the sigmoid Here again the comparatively short duration of the symptoms must be noted

In this situation, the subjection of the suture line to the mechanical irritation and pressure of solid fecal material warrants the insertion of the abdominal drain, although some protection is afforded by the passage of a tube into the lumen of the gut above the point of suture

In the first case the result proved most satisfactory and the patient is still free from recurrence In the second case, unfortunately the general condition of the circulatory system was chiefly responsible for the patient's death The method had, however, proved its value in that at no time after the operation was there any evidence of leakage or peritonitis

In conclusion, it seems desirable to call attention to the danger of subsequent leakage in end-to-end anastomosis when the resected ends of the intestine are unduly congested or friable This seems to have been the cause of the patient's death in many of the cases reported in the current literature on this subject That this unfortunate termination can sometimes be averted by the method here suggested seems reasonable If, however, the abdomen is to be tightly closed without the safeguard of moderate drainage or of temporary anchorage of the affected loop to the parietal peritoneum, then side-to-side anastomosis with the closure of the resected ends by the purse-string suture seems to yield the most satisfactory results If the condition of the resected ends is normal, however, end-to-end anastomosis without drainage (except in the sigmoid) can be adopted without fear of subsequent peritonitis

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX¹

BY GWILYM G DAVIS, M D,

OF PHILADELPHIA

THE most popular incision at present for the removal of the appendix is probably that first described by Battle (*Brit Med Journ*, 1895, 11, p 1360) and later by Jalaguier (*La Presse Médicale*, 1897) and Kammerer (*ANNALS OF SURGERY*, 1897, xxvi, 225) It is made along the outer edge of the rectus muscle, and the skin being drawn toward the median line the anterior layer of the sheath of the rectus is incised longitudinally The rectus is then displaced inwardly, and such portion of the sheath as may be present, and the transversalis fascia and peritoneum incised posteriorly This operation was modified by Lennander (*Cent fur Chnurg*, 1898 xxv, 90) and Edebohls (*Med Record*, 1899, p 665) by going directly through the fibres of the rectus instead of drawing it to one side and the method is used at least by many for all kinds of cases, suppurative and otherwise

The operation of McBurney (*ANNALS OF SURGERY*, 1894, vol xx, p 38) is also frequently used He made an incision four inches long in the direction of the fibres of the external oblique about one inch from the anterior superior spine crossing a line drawn from it to the umbilicus nearly at right angles One third of the incision is above this line The external oblique fibres were divided in the line of the skin incision and the internal oblique and transversalis fibres parted in a direction nearly at right angles to those of the muscle above

Harrington (*Boston Med and Surg Jour*, Aug 1899) and Weir (*Med News*, Feb 17, 1900, 241) suggested continuing the separation of the internal oblique and transversalis inward by dividing the sheath of the rectus and pulling it toward the median line This was done in order to obtain additional room in cases in which the McBurney incision had

¹ Read before the Philadelphia Academy of Surgery, October 2, 1905
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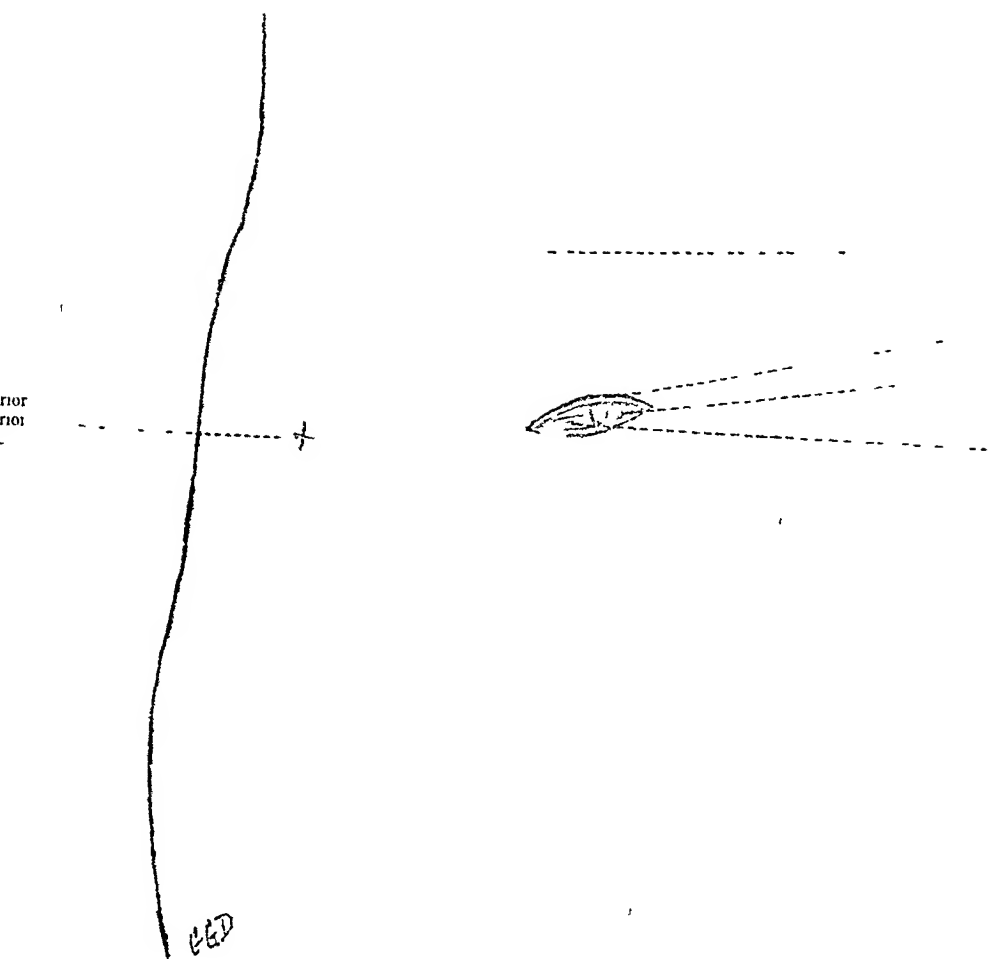


FIG. 1—Small incision for simple cases

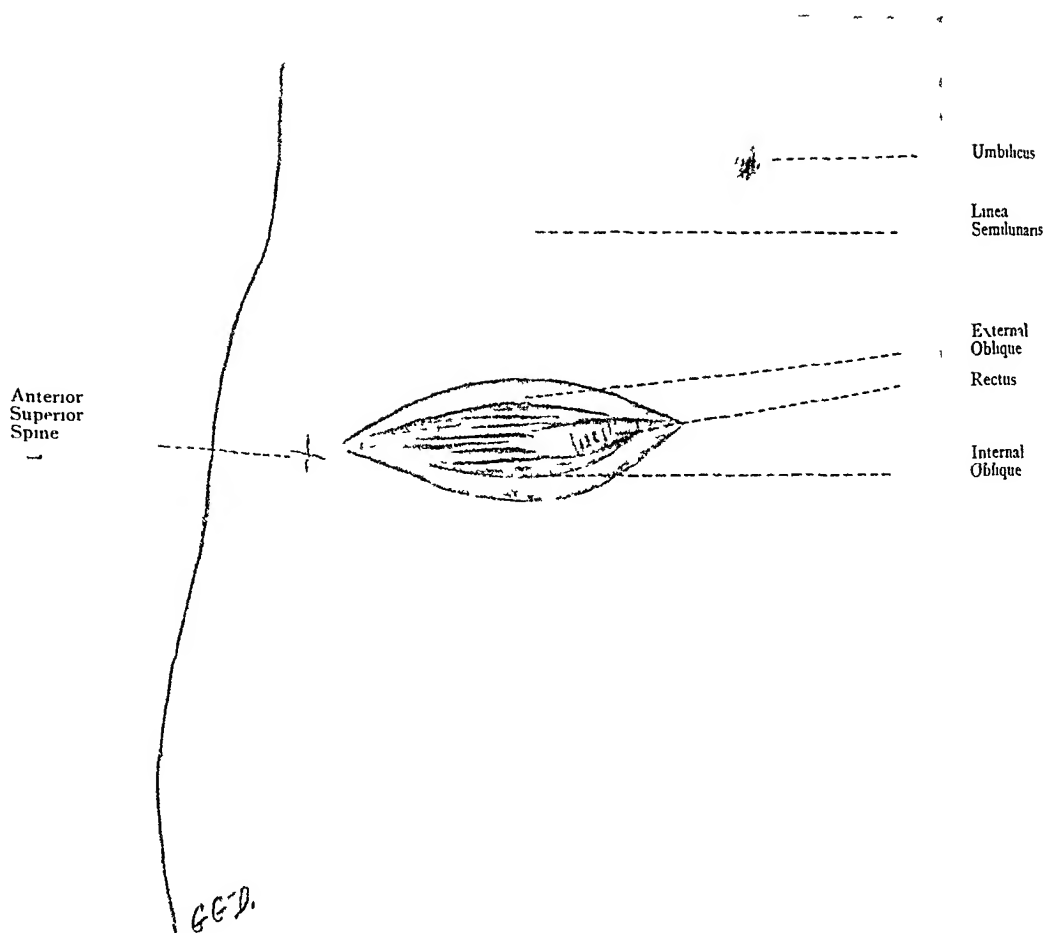


FIG 2 —Large incision for difficult cases

been found to be insufficient Quite recently I have come across the paper of J W Elliot, (*Boston Med and Surg Journal*, 1896, vol 11, p 433) which seems to have been overlooked by most surgical writers He made his incision beginning at half an inch inside of the linea semilunaris The external oblique was divided in the line of the skin incision and the internal oblique and transversalis were divided in the direction of their fibres and in the line of the incisions above If more room was desired he suggested that the incision could be prolonged along the linea semilunaris or into the rectus muscle if necessary

It is thus seen that there are three ways of operating—one through the sheath of the rectus longitudinally, another by McBurney's operation with the Harrington and Weir addition and the third the transverse incision of J W Elliot through the external and internal oblique and transversalis muscles

Of the longitudinal incision of Battle and its modification of going directly through the rectus the former seems the better for the following reasons The incision through the muscle weakens it at this point In Battle's operation the rectus presents an intact muscle to resist the inside pressure and the incisions through the sheath are overlapped by the muscle slipping back into place In the modified operation there is left a straight scar from the skin to the peritoneum Division or parting of the muscle is certain to wound some of the branches of the deep epigastric artery or even sometimes the main trunk This is more apt to be the case if the fibres are parted from above down than from below up In longitudinal incisions generally the nerves supplying the rectus are liable to be cut through as well as the vessels These nerves are motor in character as well as sensory and come from the tenth, eleventh and twelfth intercostals If cut they, like other motor nerves, do not tend to unite If large incisions are needed the amount of muscle paralyzed is considerable If drainage is used it is brought out directly through the lower angle of the wound and it is needless to point out how favorable this is to the production of hernia

Paralysis of a part of the rectus is recognized by, first, the operated side of the abdomen protruding more than the sound

side and, secondly, by observing that when the rectus contracts the scar is dragged up by the uninjured part of the muscle while the paralyzed lower portion offers no resistance. Another objection to incising the sheath of the rectus pointed out to me by Dr Porter is that infection may travel along beneath it instead of coming up to the surface. McBurney's operation is good in easy cases but in difficult and suppurative operations it does not give sufficient room and makes a nasty wound if infected and unsuitable for efficient drainage. The operations of Harrington and Weir possess all the objections of the McBurney with the exception of the slight additional space gained by displacing the rectus.

Proposed Incision —For easy cases the incision is made directly transverse one and a half inches long. Its center is to be on the semilunar line on a level with the anterior superior spine. The aponeurosis of the external oblique is divided in the line of the skin incision but obliquely to the direction of its fibres. The fibres of the internal oblique and transversalis muscles are parted—not cut—in the same line as the structures above. The peritoneum is then opened and the incision carried inward through first the anterior layer of the sheath of the rectus. A blunt retractor three-quarters of an inch wide is then inserted and the muscle drawn toward the median line. This exposes the transversalis fascia and peritoneum posteriorly which are then also divided. Thus is obtained a triangular opening with its base of three quarters of an inch and two sides of about an inch long which is ample for simple cases.

For Difficult Cases —If the case is a difficult one the outer end of the incision is prolonged to the anterior spine or even above and inwardly through the sheath of the rectus to within an inch of the median line. This will give an opening four to five inches long according to the size of the patient, sufficiently large to insert the hand if necessary and through which the appendix can be extracted under almost all circumstances.

The operation was developed as follows. Previous to about eight years ago the incision parallel to Poupart's ligament dividing all structures in the line of the skin incision was used. About that time, desiring to avoid the transverse division of the muscular fibres of the internal oblique and transversalis, the incision was made higher up on the abdomen,

practically Elliot's operation. It began where a line from the femoral artery to the umbilicus crossed the linea semilunaris (about opposite the ant sup spine) and went outward and slightly upward toward the crest of the ilium. In cases requiring a large incision room was obtained outwardly and the ascending branch of the circumflex iliac artery was divided. It was to avoid doing this that for the past two years the incision as above described has been used. The center of the incision on the linea semilunaris opposite the anterior spine is almost over the base of the appendix. Sometimes it is higher, more rarely it is lower, in either case it is easily within reach. The ileo cæcal junction lies three-quarters of an inch above the base of the appendix so that one serves as a guide to the other. The incision is designed to avoid wounding arteries. The deep epigastric always enters beneath the edge of the rectus muscle below the level of the anterior superior spine and its main trunk is out of the way. To divide and ligate the epigastric vessels as suggested by Weir appears to be an objectionable and unnecessary procedure. As the deep epigastric proceeds upward it lies on the under surface of the muscle at about its middle or often a little toward the outer side, sending branches to each side, the larger ones going outward. They are usually drawn aside when the muscle is retracted even in extensive operations.

At the outer angle of the wound no vessels will be divided unless the incision is carried upward and backward beyond the anterior spine as the ascending branch of the deep circumflex iliac is given off and proceeds upward just above the anterior spine. As the deep muscles are divided in the direction of the nerves these are not injured as occurs in longitudinal incisions through the rectus. The appendix in this incision is particularly accessible because its center lies almost over the base of the appendix. In the longitudinal incisions through the rectus they lie to the inner side of the base of the appendix and if it points to the right and is retro-cæcal the operator encounters the objection pointed out by McBurney of having to work outward under a shelf of tissue made by the outer margin of the wound.

In cases in which drainage is necessary the drain is brought out at the outer angle of the wound and lies close to

the bony anterior superior spine and passes through the thick muscular mass of the internal oblique and transversalis, all of which ensues against the formation of a hernia at that point

The inner portion of the wound is protected absolutely against hernia by the rectus muscle, and to its outside there are the thick internal oblique and transversalis muscles beneath, and above them the aponeurosis of the external oblique. The aponeurosis of the external oblique does not blend with the sheath of the rectus at the linea semilunaris but joins it at about one-third of the distance between the linea semilunaris and the linea alba. The division of the external oblique aponeurosis obliquely instead of parallel to the direction of its fibres may be urged as an objection but this is more than compensated for by the better access which is afforded. No hernias have come under my observation even in suppurative cases

THE RADICAL CURE OF DIRECT INGUINAL HERNIA.¹

BY GWILYM G DAVIS, M D,
OF PHILADELPHIA

THE radical cure operations for both oblique inguinal and femoral hernias are fairly well understood and satisfactory. Direct hernia is much less frequent, not so well understood and not infrequently its operative treatment is quite difficult and not always satisfactory. The direct hernias which have come under my notice have presented themselves in two forms. One form pushes its way through the conjoined tendon and comes out of the external ring. It possesses as its coverings the peritoneum, sub-peritoneal fat, transversalis fascia and thinned conjoined tendon, and intercolumnar fascia, all usually more or less matted together. The other form bulges around the outer edge of the conjoined tendon and gradually decreases in size as it extends out toward the deep epigastric artery. It is pear shaped rather than spherical in form.

In this form we might expect to see the remains of the obliterated hypogastric artery going over the sac, but I have seen no evidence of it possibly it has been pushed to the inner side behind the edge of the rectus muscle. It is recognized that when muscular and tendinous tissues are thick and abundant the operations for the radical cure of hernia are quite satisfactory and easy of performance. It is just the opposite condition that is confronted in direct hernia. The relation and construction of the conjoined tendon should be borne in mind. This tendon which is formed by the fusing together of the aponeurotic tendons of the transversalis and internal oblique muscles at the linea semilunaris passes over the rectus muscle and is almost immediately joined by the aponeurosis of the external oblique to form the sheath of the rectus. Thus it is seen that the insertion of the conjoined tendon and sheath of the rectus

¹ Read before the Philadelphia Academy of Surgery, October 2, 1905

are practically the same. The sheath below the fold of Douglas is entirely in front of the muscles. Posterior to the muscle is transversalis fascia only. As the sheath descends it inserts into the crest of the pubis its spine and a short distance—about an inch—along the ileopectineal line. The outer or lower edge of the conjoined tendon (sheath of rectus) fuses into and blends with the transversalis fascia as it goes out to the deep epigastric artery. This being the case the conjoined tendon has no free edge unless it is made by the knife dissecting it away from the transversalis fascia beneath.

Below, lying on Poupart's ligament is the spermatic cord covered by the fibres of the cremaster. The cremaster is nothing more than the lower edge of the muscular fibres and connective tissue of the internal oblique continued down over the cord.

In performing a radical cure of oblique hernia these cremaster fibres are sometimes quite abundant and may, as I have done, be utilized in closing the canal, but in direct hernia they are apt to be too scanty to be of any service. In oblique hernia the gap from the deep epigastric artery to the spine of the pubes is closed by bringing down the internal oblique muscle and conjoined tendon and sewing them beneath the cord (Bassini) to Poupart's ligament, but in direct hernia these tissues are so scanty that they are insufficient for the purpose. The suggestion of Halsted to take a flap from the sheath of the rectus and turn it outward I have never tried. The usual method resorted to to reinforce this weak spot is that of Wolfer and Bloodgood of opening the sheath of the rectus and dragging its fibres outward and sewing them to Poupart's ligament. The incision for exposing the rectus is shown in Fig 1. The external oblique has been turned back exposing the internal oblique. The conjoined tendon is drawn up and in by a retractor introduced beneath it out toward the muscular fibres. The incision is then made from the muscular fibres toward the spine of the pubis. This incision is practically made through the lower edge of the conjoined tendon because this latter fades away into the transversalis fascia in the direction of the deep epigastric artery. The transversalis fascia is then pushed back from the posterior surface of the rectus and the conjoined tendon (sheath of the rectus) raised up from

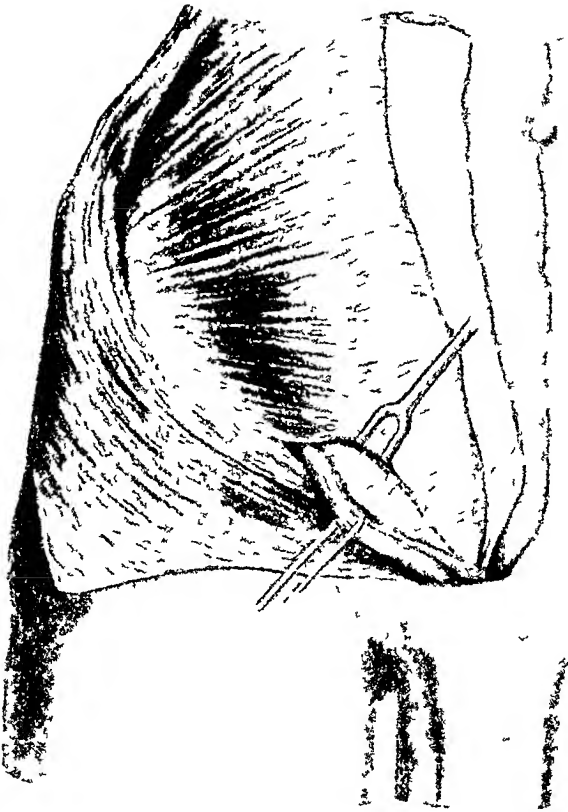


FIG 1 —Showing incision from muscular fibres of the internal oblique to the spine of the pubis, to expose the edge of the rectus muscle

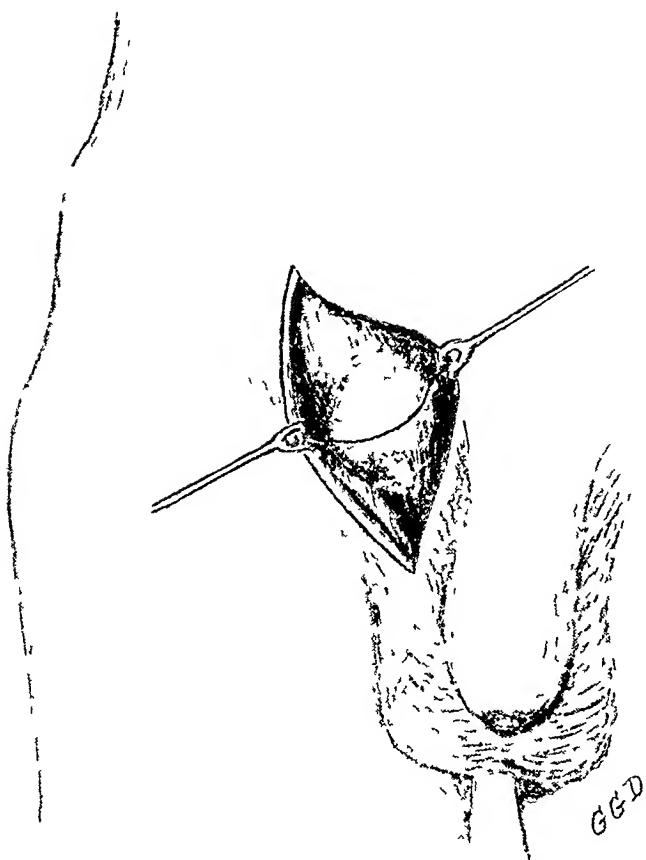


FIG 2

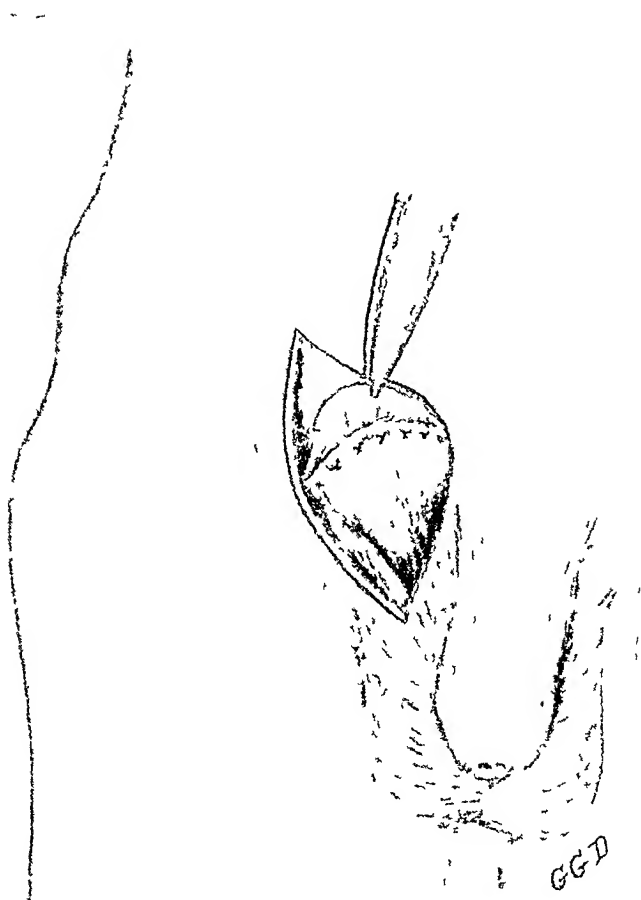


FIG 3

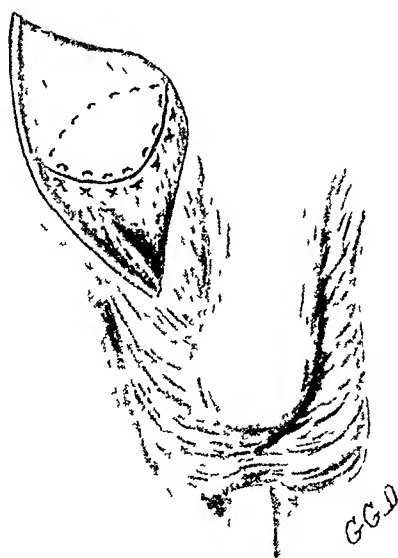


FIG. 4

its anterior surface. Personally I have not been able to draw the rectus as far out as Bloodgood advises.

After having transplanted the rectus as far out as possible then the arching fibres of the internal oblique and conjoined tendon are to be brought down and sutured to Poupart's ligament beneath the cord as in Bassini's operation. The external oblique is then sutured as desired (overlapped or not) over the cord.

In operating on the other form of direct hernia an entirely different state of affairs is presented. The rounded hemispherical tumor presents itself just above the position of the external ring with the cord below. One of two conditions will be found. Especially when the hernia is an old one the hernial coverings from the intestine within to the superficial fascia without will be a single thick strong membrane incapable of being separated into layers. When such a condition is found in several cases I have divided the sac transversely and overlapped its two parts, suturing the apex of the lower flap to the base of the upper and then bringing down the upper flap and suturing it in place as is done in the Mayos' operation for umbilical hernia. They dissect off the peritoneum but I believe it is better not to do so because it is firmly blended with the other tissues and adds considerable to the strength of the flaps, whereas alone it is too weak to be of much service. (See Figs 2 and 3.)

In some other cases the peritoneum is not adherent to the conjoined tendon and intercolumnar fascia in front but has a layer of fat between. When such is found, the fat may be scraped away and the two laid together and treated as a single layer and overlapped as already described or some other method may be resorted to. The treatment of these direct hernias is not entirely settled and different methods must be used for different conditions. As the overlapping plan has been found to work satisfactorily in cases of oblique inguinal hernia (Andrews) and umbilical hernia (Mayo) so I believe will it also be found of value in certain cases of direct inguinal hernia.

THE RADICAL CURE OF SEVERE FEMORAL AND INGUINAL HERNIA

BY JAMES H NICOLL,

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THE method of operating here dealt with is applicable to both femoral and inguinal hernia. Its main features are

(a) The employment of the sac to form an intra-abdominal buttress over the internal aspect of the hernial opening or ring, (b) the use of the pubic ramus as a *point d'appui* in the process of closure of the hernial canal, and (c) the additional security of closure obtained by the superposition on the bone sutures of a plane of fascial sutures

Its application to femoral hernia was described in the *British Medical Journal* of November 8, 1902, with a modification described in the *Scottish Medical and Surgical Journal* of December, 1903. Its employment in inguinal hernia was described briefly in 1905, and is here published for the first time *in extenso*

It is not a difficult operation, and whatever extra work is involved in the drilling of the bone is compensated for in the firm closure secured in the hernial canal. In looking to results obtained, it is necessary to differentiate in the cases treated as between cases not specially severe, on the one hand, and severe cases on the other. In ordinary cases the method gives results as good as, but no better than, many of the methods in use. In severe cases, cases of large hernial aperture, of lax and atrophic parietes, or high intra-abdominal tension from omental corpulence, the method, with its double closure of the canal by bone suture, followed by musculofascial suture, attains a high degree of security. In femoral hernia I have of late employed the method in practically all cases, though at first designing it for severe cases only. In inguinal hernia I

have as yet made use of it only in severe cases, finding other and simpler methods answer for ordinary cases

Femoral Hernia —Of formal operations for femoral hernia there are many. The simpler operations include the "purse-string" suture of Cushing, Fortunato,¹ Curtis,² and others, popularized by Coley,³ the well-known operation of Kocher, and the more or less similar suture operations of Bassini,⁴ Franz,⁵ Fabricius,⁶ Bottini,⁷ and others. What may be termed "flap" operations comprise the osteoperiosteal flaps of Trendelenburg and Kraske,⁸ the musculofascial (pectineal) flaps of Watson Cheyne,⁹ Saltzei,¹⁰ Prokudin,¹¹ and others, and the adductor longus flap of Schwartz.¹² Operations by approach from above include intra-abdominal closure of the ring by laparotomy, and by way of the inguinal region (Ruggi,¹³ Nasi,¹⁴ Parlavecchio,¹⁵ and Tuffier). With these last may be included closure of the femoral canal by the employment of the fascia transversalis (Buonamici),¹⁶ and the method of Lotheissen,¹⁷ or (*vide* Kammerer¹⁸) the Lotheissen-Gordon¹⁹ method, in which the conjoint tendon of the internal oblique and transversalis is attached to Cooper's ligament.

The following is the technique of the operation I employ

A *Obliiteration of the sac*, also of the peritoneal depression over the abdominal aspect of the ring, and the substitution of a buttress over the internal aspect of the ring

1 Expose the sac, and clear it from surrounding tissues (the skin incision may be vertical or transverse)

2 Open the sac longitudinally in its middle line, and clear of contents

3 Separate it from parts surrounding its neck, including the transversalis and the iliac fasciæ for one inch round the abdominal aspect of the ring

4 Bisect the sac longitudinally from fundus to neck (Fig 1)

5 Make an aperture in one half near the neck (Fig 1)

6 Interlock the halves by putting the other through the aperture (Fig 2). In certain cases it lies better if previously twisted one half-turn on its longitudinal axis

7 Reduce the whole sac through the femoral ring into the extraperitoneal space previously cleared for it by detaching its neck from the abdominal aspect of the ring. The sac thus lies bunched up within the abdomen, between the peritoneum and the transversalis and iliac fasciæ over the internal aperture of the femoral canal.

Where the sac is unnecessarily large, part of it may be cut away before reducing it through the canal.

B Closure of the *Femoral Ring*

1 Carry an incision (bone-deep) from the femoral vein along the pubic ramus to the region of the pubic spine. This



FIG 1—Sac emptied, detached from surrounding parts, including internal aspect of abdominal wall for one inch round femoral ring, split longitudinally, and one half incised for passage of the other.

divides the pubic portion of the fascia lata, the origin of the pectineus, and the periosteum. Its length will depend on the extent to which the femoral vein has been displaced outward by the presence of the hernia, and will vary from one inch to one inch and a half.

2 Detach the periosteum to a limited extent, and retract it

3 Drill the bone near its upper edge in two places one-half inch to one inch apart (one drill-hole may be made to suffice) Any bone drill or punch may be used In the illustration (Fig 3), the simple hand drill and the tongue depressor used as a protecting spatula are those I commonly employ

4 Pass through one of the apertures a loop of stout catgut, or other absorbable ligature (Fig 3) This may be passed by threading it in the eye of a curved surgical needle, or by

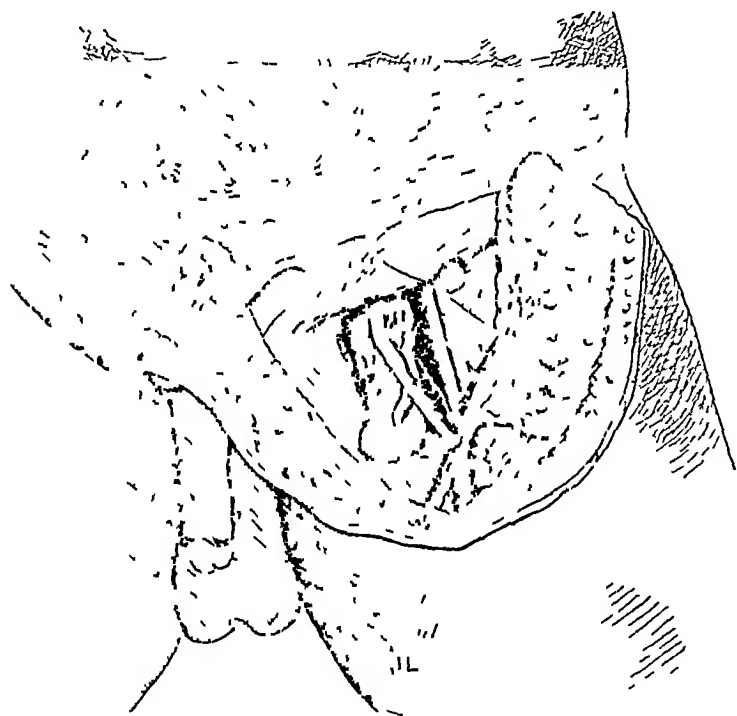


FIG 2—Sac ready for reduction, with halves interlocked (The situation of the aperture in the sac in Figs 1 and 2, and the relative positions of the two halves of the sac in Fig 2 are not, in the interests of semidiagrammatic clearness in the drawings, quite those of actual practice)

pushing it through, simply doubled on itself It is, however, more easily passed by threading it in the eye of the bone drill or in the eye of an ordinary surgical probe For the purpose, I employ a special probe in which the eye is small and placed very near the extremity of the handle (Fig 4) The advantage of that shape and position of the eye will be obvious to

those familiar with drills for wiring fractures, or to any one in his first performance of this operation. With such a probe the operation is of the simplest, without it, some difficulty may be experienced in passing the suture through the aperture. The probe should be of the ordinary pliable type.

5 Divide the loop of ligature. Thread one end in a large curved surgical needle and pass it as a mattress suture through Poupart's ligament. Unthread it from the needle (Fig 4).

Repeat this with the second end, carrying it through Pou-

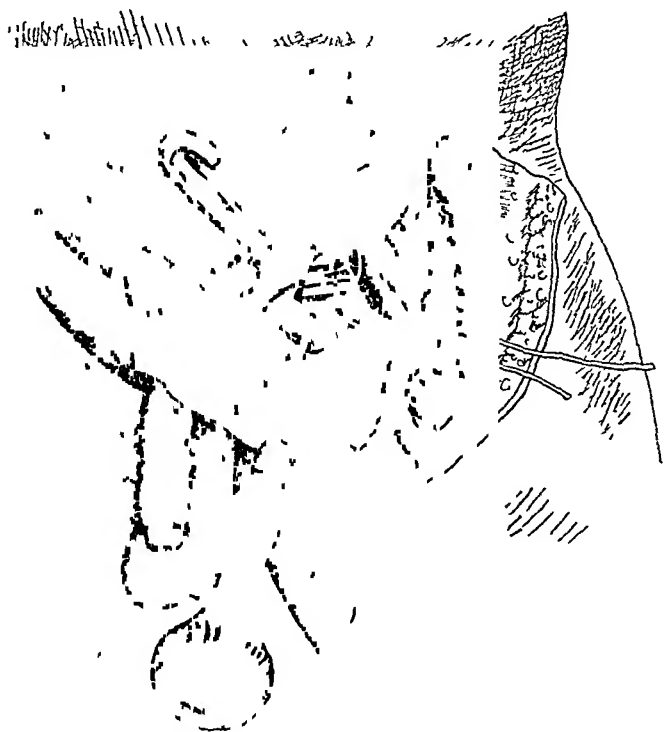


FIG 3—Closure of ring, drilling of bone, looped catgut suture passed through first drill hole

part's ligament at a higher level (Fig 4), avoiding the deep epigastric artery to the outer side, and, in male patients, the spermatic cord above. (In very large herniæ, the loops, instead of being placed the one directly above the level of the other, as figured, may be made to diverge in the ligament so as to "gather in" the margin of the aperture.)

6 By means of the probe (into the eye of which the ends

are threaded) withdraw both ligatures through the second drill hole in the bone (Fig 4) It is in this part of the operation that the special probe is of particular advantage, even if the common device of the loop tractor indicated in Fig 9 be adopted

7. Tie the ends of each loop separately over the front of the bone, thus bringing Poupart's ligament down to the posterosuperior surface of the bone and fixing it firmly in contact with that surface, constituting what is in effect an extension



FIG 4—Closure of ring, placing of the loops in Poupart's ligament, and return of the ends through second drill hole (One loop tied loosely to indicate action in pulling Poupart's ligament down to posterosuperior aspect of ramus of os pubis)

outward of Gimbernat's ligament, and absolutely closing the femoral ring to whatever extent may be desired, due regard being paid to the amenity of the femoral vein The degree of occlusion is regulated by the position of the sutures in Poupart's ligament, but not by the tension with which they are tied This latter does not vary, the knots being tied in all cases firmly to bring the ligament into contact with the bone (Figs 4 and 5)

8 To make the closure doubly secure, complete the operation by uniting, by interrupted catgut sutures, the detached margin of the pectineal origin and the pubic portion of the fascia lata to the "anchored" Poupart's ligament (Fig 5)

REMARKS ON THE FOREGOING DESCRIPTION OF THE FEMORAL OPERATION

Method of Treating the Sac—The manoeuvre of returning the emptied sac through the canal of a hernia is not new While descriptions of such operations may be found far back

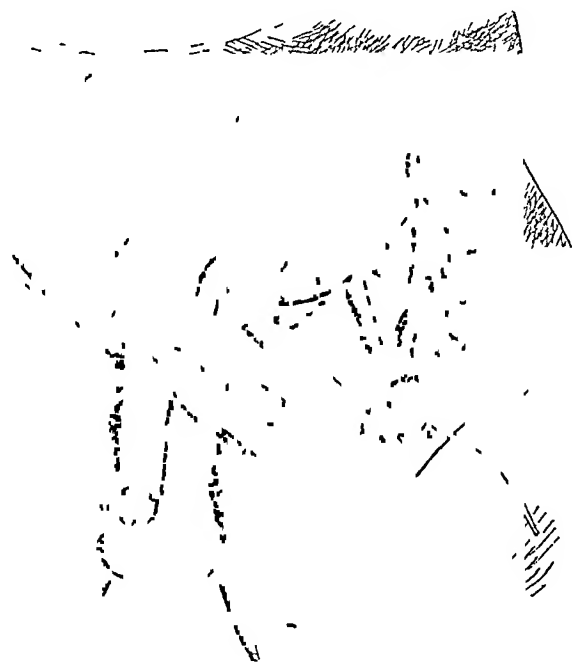


FIG 5—Closure of ring, bone sutures tied, completion of closure by suture of fascia lata and pectineus to the fixed Poupart's ligament

in surgical records, the practice was first put upon a formal footing by Sir William Macewen, and to his advocacy is due the general recognition of the great value of the buttress formed over the abdominal aspect of the ring by the puckered-up sac Macewen, as is well known, puckers up the sac by a "gathering" suture which, passed through the hernial canal and out through the parietes, is made the means of puckering up the sac on the abdominal aspect of the ring Variations of

the technique by which Macewen's object is attained have been introduced by other surgeons (*vide*, for example, the operations of Davis²⁰ and Packard,²¹ and the method described above is but one of these variations

The Absence of All Sutures in the Sac has Three Advantages

- 1 The obvious saving of time
- 2 Avoidance of the recognized risk of strangulation, and consequent sloughing, of the puckered-up sac in the grasp of the ligature

- 3 The facility with which the entire sac may be placed within the abdomen. A suture emerging from the neck of a large sac may, while pulling the neck within the abdomen, by anchoring it to the parietes leave the bulky fundus blocked in the canal. The absence of a suture permits the interlocked sac to be pushed as far within the abdomen as may be desired.

Against these advantages there is to be placed, I believe, one disadvantage, and that a minor one, involved in the absence of suture, namely, that the fixing of the sac in position depends on the tying of the sutures closing the ring, and not upon a special sac suture, and that, therefore, it is necessary, particularly in cases where the patient has "strained" between the placing of the sac and the tying of the ring sutures, to verify and, if need be, adjust the position of the sac before tying the sutures closing the ring. Once tied, these sutures close the ring absolutely, and no prolapse of the sac into the canal is possible. In femoral hernia I have never seen any tendency of the sac to prolapse before closure of the ring, but I have seen it in several cases of inguinal hernia. The explanation may lie in the fact that the inguinal rings are more freely affected by "straining" or deep respiration than is the femoral.

Method of Closure of the Femoral Aperture —In the first description given of the operation (Glasgow Pathological and Clinical Society, April 14, 1902), I stated that, in looking into the literature of the subject, I found that Roux²² had also been carrying out in the closure of the ring the idea of

attaching Poupart's ligament to the bone, though employing a different method to attain that end, namely, the use of a U-shaped metal nail driven through the ligament into the bone, and that it was somewhat surprising that a further search (so far as the regrettable decease of the invaluable *Index Medicus* permitted such to be made) should have revealed no other references to the utilization of so conveniently placed a *point d'appui* as is offered by the pubic ramus for the closure of the femoral ring on the classic principle of restoring its boundaries to their correct, or to an over-corrected, position

The method of closing the ring above described, and which I had been practising for some time before I learned of Roux's independent work, is, in my probably too partial opinion, preferable to that adopted by Roux, for the following reasons

1 Roux's operation involves the introduction of a metal foreign body. The subsequent removal of this, if desired, involves a second operation, with the risk of detaching the ligament from the bone in withdrawing the nail. Its permanent retention, on the other hand, involves the chance of the loosening of the nail by absorption (possibly necrosis) of the bone, as occurs not infrequently with wire sutures in fractures. Should this occur, and the nail become dislodged from the bone by the natural pull of Poupart's ligament or otherwise, a state of matters is established in which every movement of the thigh or abdomen would menace the femoral vessels and the peritoneum with puncture by the points of the nail

2 The method of suture employed in the operation I have described brings Poupart's ligament down to the posterosuperior surface of the bone, attaching it there in the region of the ileopectineal line on the plane of Gimbernat's ligament, constituting virtually an artificial extension of that ligament. The effect of such an attachment, as a study of the anatomy of the region will show, is to occlude the femoral aperture at its extreme upper (inner) end (the plane of Gimbernat's liga-

ment), thus shutting its mouth, instead of closing its throat as the attachment of Poupart's ligament to the superior or anterosuperior surface of the bone does

3 By varying the position of the two mattress loops of ligature, or by making them diverge, in Poupart's ligament, it is easy to effectually close the largest femoral ring without exerting pressure on the femoral vein The tension of the femoral sheath may be regulated with precision

4 Roux's nail attaches Poupart's ligament to the peri-



FIG 6—Modification of femoral operation Anterior lip of periosteal incision raised in the form of a short periosteal-fascial flap through which the sutures have been passed

osteum The operation above described attaches it independently to both bone and periosteum

5 The second plane of (musculofascial) sutures affords an additional security in the closure which Roux's operation does not possess

Modification of Operation—The following modification is not intended as a regular substitute for the second part of the operation, the closure of the femoral canal In effect it is less secure It affords the means, however, of attaching

Poupart's ligament in the desired position in cases where the operator is not supplied with a drill, as when hurriedly called to operate in a case of strangulation

The sac having been reduced into the abdomen, and Poupart's ligament pushed back with a spatula, an incision is carried along the posterosuperior aspect of the pubic ramus from the femoral vein to the pubic spine (or part of that distance) This divides the periosteum Its anterior lip is then raised to a slight extent by any convenient elevator, such as



FIG 7—Modification of femoral operation Suture knots tied on anterior (outer) aspect of anterior lip of periosteal incision, thus lodging the free margin of Poupart's ligament in the periosteal incision

N B—In Figs 6 and 7 the periosteal lip or flap is necessarily represented as raised too extensively, and, therefore, too long

the flat end of an ordinary probe bent to a suitable angle or the blade of a pair of curved scissors The effect of this is to form a short periosteofascial flap, the size of which has, for the purposes of illustration, been exaggerated in Fig 6

With an ordinary curved surgical needle the catgut suture is carried through Poupart's ligament, divided, and the ends,

again threaded in the needle, successively passed into the periosteal incision and out again through its anterior lip (Fig 6) The tying of these ends lodges the free margin of Poupart's ligament in the periosteal incision on the posterosuperior aspect of the bone, thus closing the canal (Fig 7)

As already mentioned, the closure thus obtained is less secure than that resulting from the bone suture method Further, if the periosteal incision be made too long, or the anterior lip be raised as far as it, necessarily, has been in the illustrations, the result will be the attachment of Poupart's ligament, not to the posterosuperior, but to the superior surface of the bone, a much less efficient attachment

Inguinal Hernia—As applied to inguinal hernia, the method, as stated above, has in cases of ordinary severity probably no advantages over any of the many other methods in use In severe cases, however, the combination of internal buttress, bone sutures, and superimposed musculofascial sutures involved in the method secures a closure of the aperture more absolute than can *in such cases* be secured by probably any other method For it must be recollected that in practically all the known methods of operating for inguinal hernia, the *point d'appui*, whether the sutures are carried through the structure itself, or through other structures attached to it, is Poupart's ligament The old, large, "severe" inguinal hernia rests on a Poupart's ligament which has stretched into a thin lax band sagging loose in a downward curve between its points of support at pubic crest and iliac spine What in its normal condition constitutes an efficient fixed support on which the closure of the canal may be securely made, becomes, when stretched in an old severe hernia, considerably less efficient for the purpose One of the main ideas concerned in the application of this method to inguinal hernia is to reinforce in such cases the defective Poupart's ligament by the backing of the pubic ramus

The technique of the operation in inguinal hernia is as follows

A *Obliiteration of Sac, and Formation of Intra-abdomi-*

nal buttress—The treatment and final bestowal of the sac are carried out as in femoral hernia, and the terms of the description given in that case may, *mutatis mutandis*, be applied to inguinal hernia (Fig 8), the sac being lodged over the internal aspect of the internal inguinal ring as a pad resting between the parietal peritoneum, on the one hand, and the fascia transversalis on the other

B Closure of the Inguinal Canal

- 1 With blunt retractors pull the spermatic cord (or round

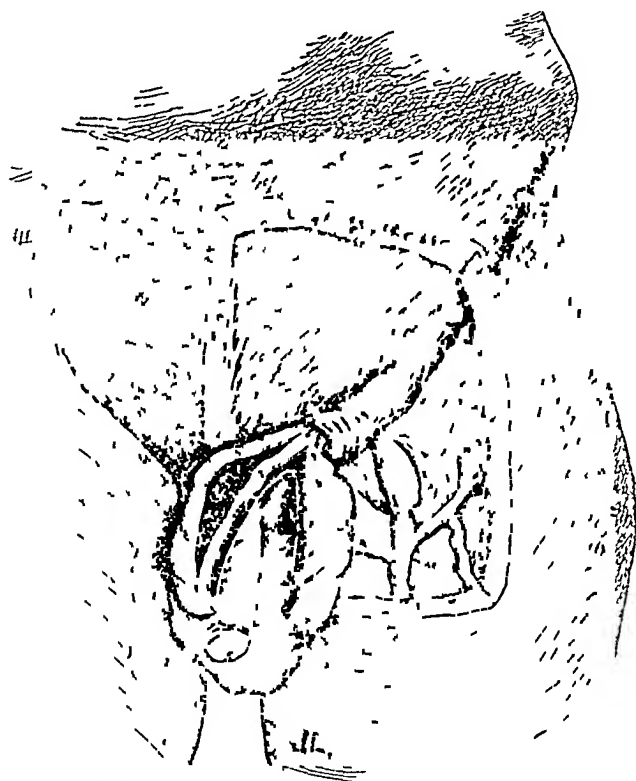


FIG 8—Sac emptied, detached from surroundings, bisected, and incised for interlocking and reduction

ligament) upward and Poupart's ligament downward. The lax condition of the latter in cases of severe hernia permits free retraction, affording space not indicated in a dissection of the normal region.

- 2 Carry an incision along the superior aspect of the pubic ramus. This divides the iliac fascia, the origin of the

pectineus, and the periosteum Its limits are the pubic spine and of the femoral sheath

3 Slightly detach both margins of the periosteal wound

4 Drill the bone, near its upper margin, in two places, one-half to one inch apart The drill-holes are situated somewhere between the pubic spine and the femoral sheath, their exact position varying with the shape and size of the hernial aperture The drill may be applied to the bone above the level

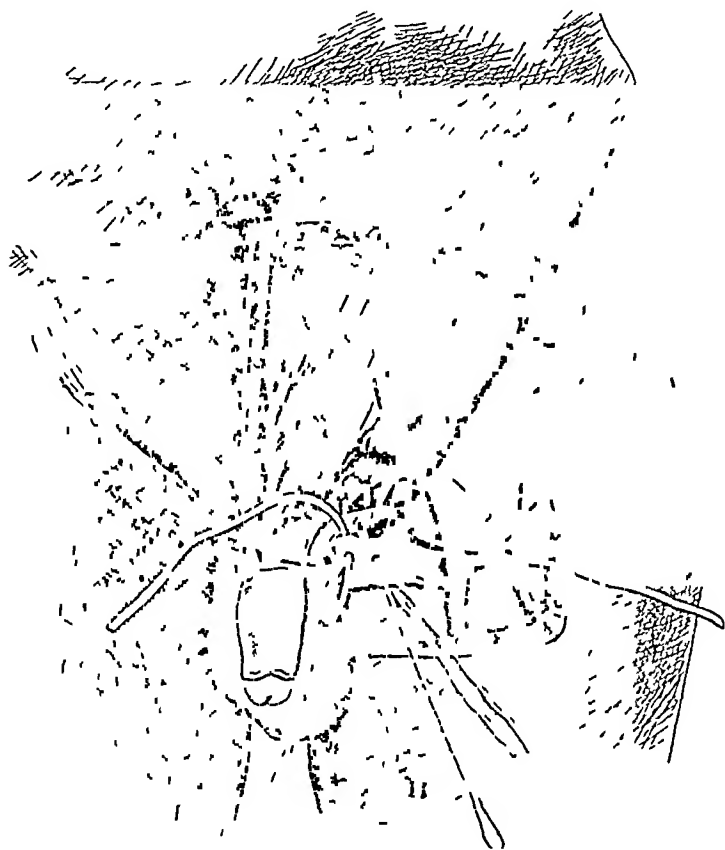


FIG 9—Closure of canal, bone drilled, mattress suture placed in internal pillar, and withdrawn through drill holes by probe and loop-tractor

of the retracted Poupart's ligament, in cases in which that is sufficiently lax to afford the necessary room for passing the drill *transversely* through the bone In cases in which that is not so the drill should be applied to the anterior surface of the bone below the level of Poupart's ligament, and, in consequence, after perforating the pubic portion of the fascia lata

Transverse perforation of the bone is essential. Oblique perforation places the internal apertures of the drill-holes far down on the posterior aspect of the bone, and more or less inaccessible (*Vide*, also the position of the ligature knots, as described below)

5 Pass a stout absorbable ligature, in the form of a large mattress suture, through the internal pillar of the hernial aperture. It is essential that this should have a "good bite" of the conjoined tendon and of the fascia transversalis (Fig 9). It may or may not include the external oblique. During

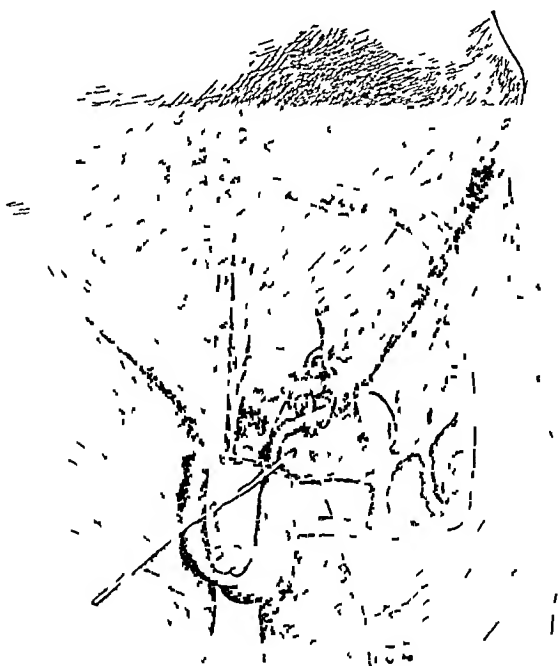


FIG 10—Closure of canal, suture, traversing internal pillar, and drill holes in bone, ready for tying. The suture, here represented single, is commonly used double, each loop being tied separately.

the placing of the suture, the peritoneum is protected by the finger passed through the canal into the extraperitoneal fat behind the internal pillar. While indicated in the illustrations as single, the ligature should be double (*vide* Figs 3 and 4), the loops being placed one above the other.

6 Pass the ends of the sutures out through the holes drilled in the bone. Of various methods of doing this, the

most expeditious are either the special probe indicated or the loop tractor (Fig 9)

The sutures may pass in front of the spermatic cord or behind it (Fig 10), as may seem best to secure firm closure of the canal without undue compression of the cord. In the event, the cord will occupy in the former procedure the position of the direct inguinal hernia, in the latter that of the oblique variety

7 Tie the ends of the two loops of ligature separately

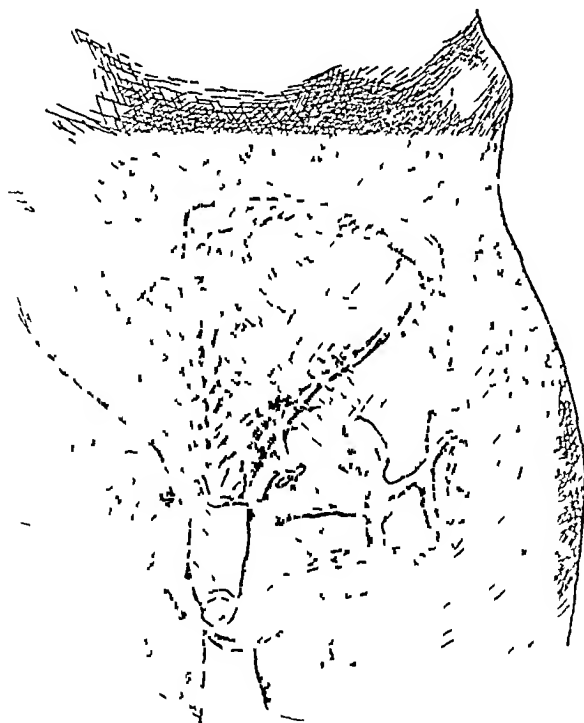


FIG 11 —Closure of canal Poupart's ligament sutured to the internal inguinal pillar

The tightening of the knots brings the internal pillar down into the periosteal incision and lodges it firmly against the bone

The position of the knots may vary. In Figs 9 and 10 the ends of the suture, after having been passed out through the drill-holes in the bone, have been carried from within outward through the pubic portion of the fascia lata below the level of Poupart's ligament, and (Fig 11, x) tied there, on

the external surface of the fascia. Or the suture ends, after traversing the bone, may be tied above the level of Poupart's ligament (Fig 12), the knots lying between Poupart's ligament and the bone, or even between the periosteum and the bone, though the latter position is not free from objection on account of the risk of interfering unnecessarily with the vitality of the bone. The same choice of position, above or below Poupart's ligament, applies to the direction of the drill in making the perforations in the bone (which see). The factor in the choice of the position of both drill and ligature knots is the degree of relaxation which has occurred in Poupart's ligament.

The knots should in all cases be tied firmly to lodge the internal pillar against the bone. Here the amenity of the spermatic cord is efficiently protected, as is that of the femoral vein in the femoral operation, by adjusting the position and size of the loops of suture in the internal pillar, and not by varying the tension of the knots. Should threatened compression of cord (or vein) necessitate the "replacing" of the loops, time may be saved by dividing each loop above the bone and retaining the ends as tractors for the passage of the new sutures.

8 Complete the operation by lifting the lax Poupart's ligament to the anterior surface of the internal pillar, and fixing it there by interrupted sutures which should be of stout catgut, or other absorbable material, and should penetrate at least the external and internal oblique muscles. This final step in the operation is, obviously, one made possible solely by the lax condition of Poupart's ligament. It is difficult in small herniæ, impossible in the normal cadaver, and not easy to depict by pencil, however skilled (Fig 11).

Modification of Operation—As in femoral hernia, the method may be modified in cases where the operator finds himself unprovided with a drill. The anterior lip of the periosteal incision is a stout structure, comprising, in addition to the periosteum, the iliac fascia and the origin of the pectineus. This lip is to be slightly raised, and the ends of the suture

carried through it from within outward (Fig 12) and tied there. The knot may lie above or below the level of Poupart's ligament (see remarks above). The operation is finished by suturing Poupart's ligament to the anterior surface of the internal pillar as described above (Fig 11). The closure obtained by the modified operation is less secure than where bone suture is employed, but has been found efficient.

Remarks on the Foregoing Description of the Inguinal Operation—It may be well to disarm criticism by repeating



FIG 12.—Modification of inguinal operation. Anterior lip of periosteal incision raised in the form of a short periosteofascial flap through which the sutures have been passed.

that this method of operating appears to have less *raison d'être* in inguinal than in femoral hernia, and has been employed for "severe" cases only. Further, it is to be noted that the method involves three distinct procedures in combination, and that the modification above described in the second procedure (the use of the anterior lip of the periosteal incision) comes near to trenching on known ground, while the third procedure (the suturing of Poupart's ligament to the internal pillar) is com-

mon to the majority of recognized operations for the radical cure of inguinal hernia

To the skill and kindness of Dr John Lindsay, of Glasgow, I am indebted for the sketches which form the illustrations

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THE RADICAL OPERATION FOR INGUINAL HERNIA

A METHOD FOR CLOSING ALL LAYERS WITH A SINGLE TIER
OF EASILY REMOVABLE NON-BURIED SUTURES

BY JOSEPH RILUS EASTMAN, M D,
OF INDIANAPOLIS, INDIANA

IN most cases of recurrence after radical operation for hernia it will be found that faulty asepsis is responsible for the accident. This is shown by the circumstance that since rubber gloves have come into general use the percentage of recurrence has been lowered in the experience of practically every surgeon who has made a considerable number of such operations. No matter what the method, if the sac be amputated high enough, hernia will not often recur provided the operative technique be aseptic. Very often the chain of asepsis is broken by the introduction of non-asepticizable absorbable sutures. An absorbable suture is never more than relatively aseptic, which means practically that it is not aseptic at all. On the other hand, the burying of non-absorbable sutures is attended with some danger, and few operators are willing to bury non-absorbable material in operating for inguinal hernia.

Upon the accompanying cut is represented a method for introducing a single tier of non-absorbable sutures which sutures coapt all the layers either according to Ferguson's so-called anatomic method or according to Bassini's. These sutures may be easily removed after firm union has taken place. So far as the possibility of its introduction is concerned, any sort of non-absorbable suture material may be used in this way. In eleven cases thus operated the writer has used heavy Pagenstecher celloidin linen. The manner of introduction of the sutures is simple. The time required for operating, all things being equal, is less than that required for the execution of the classical radical operations.

After incision down to the aponeurosis of the external oblique, exposing both rings, the overlying superficial tissues should be wiped with gauze from the aponeurotic layer to such an extent that Poupart's ligament may be freely exposed. After reduction of its contents, the sac should be twisted upon itself as practised by C H Mayo, so that all the slack of the peritoneum about the neck of the sac may be taken up before the transfixing suture is introduced.

The Pagenstecher linen suture bearing a needle upon each end is first passed through Poupart's ligament from without inward one inch from its free margin. It is then passed through the outer border of the obliquus internus and transversalis muscles and brought back through Poupart's ligament about one-third of an inch nearer the margin of this ligament than its first point of passage. The needle now external to and above Poupart's ligament is made to overlap the free margins of Poupart's ligament and the aponeurosis of the external oblique by carrying the linen through in the form of a simple running mattress suture. The needle is next passed through the superficial fascia, panniculus adiposus, and skin emerging about one-eighth of an inch from the skin wound margin upon the side opposite Poupart's ligament. The needle upon the tail end of the suture is brought up through the subcutaneous fat and skin upon the side of Poupart's ligament. When traction is made upon the two ends of the suture, no kinks or curls remain, and the suture is tied up as a simple loop and, being clipped, may be drawn out with the slightest traction.

In almost all cases it will be found easy to execute Ferguson's operation in this way, five or six sutures sufficing to coapt the layers anatomically from the internal ring to the pubic bone. Pursuant to Coley's suggestion relative to the Bassini operation, the writer has always introduced one of these sutures above the internal ring to reinforce this weak point.

In the radical operation for inguinal hernia in children, the method here described will be found applicable in practically every case, where, as Czerny has contended, the more

or less complicated classical methods of operating are quite unnecessary. In small herniæ of adults, the simple tier method is applicable. In very large herniæ with wide separation of the conjoined tendon and Poupart's ligament this suture will for obvious reasons not be efficient.

It should be understood that nothing whatever is claimed for the method except that all the layers may be readily and securely coapted in this manner in nearly all cases of hernia. As to the ultimate results, nothing is claimed, since the writer's operations have all been made within the year. There is, however, no apparent reason why the permanent results should not be good.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 25, 1905

The President, HOWARD LILIENTHAL, M D , in the Chair

OPERATIVE TREATMENT OF CLEFT PALATE

DR CHARLES H PECK read a paper with the above title (for which see page 5)

DR H LILIENTHAL presented a girl, eight years old, who at the age of three years was operated on by him for an enormous cleft involving both the hard and soft palates. The operation done was practically similar to that described by Dr Peck, excepting that no tissue was cut away and that no obturator was used, as that device to assist in the protection and healing of the wound was at that time unknown to him.

The operation proved a complete failure, and it was decided not to resort to any further operative interference until the child was at least three years older. About that time he learned that by treating this condition with a skilfully made obturator the functional result was often better than could be obtained by surgery. He thereupon referred the patient to Dr R Ottolengui, of this city, who devised an obturator for her to wear. She was the youngest patient who had ever been fitted with such an appliance, and her condition at the time was very poor. She had a severe nasal catarrh, her voice was discordant and exceedingly disagreeable, and she was totally unable to make herself understood.

She had now worn the obturator about two years. Her general condition had greatly improved, her catarrh had disappeared, and while the result was still far from perfect, both her speech and the quality of her voice were vastly better. She was beginning to talk fairly well and was attending school.

DR CHARLES N DOWD said that one of the interesting questions that arose in the discussion of this general subject was whether to operate upon very young children? Dr Brophy, of Chicago, had operated on a large number of patients under six months of age, and his results were favorable. He used lead plates, which supported the palate on each side, and he omitted the lateral incision. Dr Dowd said he had done this operation three or four times, and had found the plates of real service in the younger class of children. He did not think it was practicable, in those patients, to use an obturator.

DR ELLSWORTH ELIOT, JR., said that in every case of cleft palate where there was a reasonable hope of success, he thought an operation should be undertaken. Even if the operation proved unsuccessful, he understood that it did not interfere with the subsequent application of a mechanical appliance.

As regards the age at which operative interference should be recommended, the speaker thought it should not be done too early, when the parts were very small, nor too late, and before any marked defects of speech had been acquired. Personally, he preferred to operate at the age of four or five years. In the case of a young man of sixteen upon whom he had done Ferguson's operation, the soft palate was not only closed but there was also great improvement in articulation. He recalled other cases in adults where the operation had also given satisfactory results. In Brophy's operation, with which he had personally had no experience, the two superior maxillæ were forcibly approximated.

DR GEORGE WOOLSEY said that in the treatment of these cases he had tried both operation and the use of an obturator. The choice of the method largely rested with the child's parents. Many people did not like the idea of their children wearing an artificial appliance in the mouth. Another objection to that method was that it could not be satisfactorily employed until after the eruption of the six-year molars, which is often delayed. Personally, he was in favor of operating in almost every case where there was a fair chance of approximating the edges of the cleft. In cases with a very wide cleft, Dr Ochsner, of Chicago, had recommended an apparently feasible method of chiselling up between the alveolar processes and the bony palate, and then plugging this gap after forcing the bony palate inward towards the cleft. Dr Woolsey said that in the single case where he had

resorted to this method he was unable to state the final outcome of the operation, as the patient had been lost sight of. The Brophy operation, in infancy, could only be done when the bony parts were so pliable that the lateral halves of the maxillæ could be forcibly approximated,—i e, in the first three months of infancy. He had only operated on one such case.

DR DOWD said that Brophy had described two distinct operations, one, in dealing with cases of complete cleft palate through the alveolar process, in which he brought the two sections forcibly together, while in the other, where the cleft was not complete, he utilized the lead plates. Dr Dowd said that about a year ago he showed the result of an operation in a child of three months where the parts came together pretty well. In that case the cleft had gone entirely through the alveolar portion of the jaw. Since that time, at a second operation, he had brought the parts still further together, so that the result was very good. In that instance it was necessary to use considerable force, and also to make an incision in the jaw above the alveolar process so as to further free the parts.

DR PECK said he had been unable to determine from Brophy's writings whether or not he attempted to secure complete closure of the soft and hard palates at a single sitting. The important feature in these operations was to secure closure of the soft palate as early as possible, so that the parts might develop with the growth of the child.

As regarded the mortality of the operation, Dr Peck said, an English surgeon had collected eleven cases, with five deaths, Brophy had reported over three hundred cases, with a death rate of three per cent. He had also reported over nine hundred operations upon the palate, but the exact extent of the lesion was not given nor the immediate nor ultimate result. He had not seen nor heard of any case operated upon in this city where the Brophy operation had resulted in a complete closure.

DR DOWD said he thought that in the Brophy operation for incomplete cleft, immediate closure of both the hard and soft palates was aimed at. In the other operation, when the cleft extended through the alveolar process and the bones had to be forcibly brought together, complete closure usually was not attempted at one sitting. However, it could be done at a subsequent operation. One feature that should not be lost sight of

in these operations was the possible shortening of the short palate, and in order to prevent that, it was of great importance to secure closure of the hard palate, so as to obviate traction. In 1901 Brophy had reported over two hundred operations in infants under six months of age without any mortality. He had a mortality in those over that age.

DR LILIENTHAL said that, in choosing between operation and prosthesis, the determining factor should be the question of mortality. A mechanical appliance, as had been demonstrated in the case shown, gave a pretty good functional result—as good, if not better than any he had seen accomplished by pure surgery. He recalled a case of congenital cleft palate where the effect of the application of an obturator by Dr. Ottolengui was such that no defect was perceptible in the patient's speech. It was so perfect, in fact, that he passed the surgeon's examination during the war with Spain, and his disability was not discovered until he contracted typhoid fever.

In a case of congenital cleft palate where the child was unable to be fed, Dr. Lilienthal thought that Brophy's operation should be promptly tried, and, if possible, done before the infant was ten days old. In those cases something had to be done without delay. In cases where the operation was not urgent, lives would undoubtedly be saved by not operating. There was a distinct mortality connected with the operation, and in the speaker's experience, a pretty high one, probably not less than ten per cent. This question of mortality should be squarely put before the parents.

As to the operation itself, the speaker said the operator would do well to take advantage of the suggestion made by the elder Warren and dip his silk sutures into the compound tincture of benzoin, which would make the knotting easier.

DR R. OTTOLENGUI said he did not agree with the statement made by Dr. Eliot that, even if an operation proved unsuccessful in these cases, it did not interfere with the subsequent application of a mechanical appliance. When these patients are allowed to remain as they were originally, they present certain conditions which have been studied and can be remedied, but after they have been subjected to a surgical operation which proves a failure, they present unique conditions, each of which necessitates special study and a special apparatus.

Such cases are much more difficult to treat by means of an obturator than if they had been left alone

The speaker said he was well acquainted with the work of Dr Brophy, and he knew of one instance where that operator had secured a fine result in articulation, and that was in an infant. It took some eight or ten years to discover whether these operations were successful or not, on account of the possibility that the palate would fail to lengthen along the cicatricial line. For that reason he thought that, if an operation was decided on, it had better be postponed until adult life, so that the growth of the palate would not be interfered with. He had never yet seen a case operated on in early life where the growth of the soft palate had not been interfered with. In dealing with a cleft of the hard palate this objection was of less importance, as there was more tissue to be utilized.

He laid special stress upon a case of a girl operated on, by his advice, at the age of four. The operation proved quite as successful as those shown at this time, and with instruction the girl learned to talk well. At the age of twelve, however, the growth of the palate, everywhere except along the cicatrix, practically produced a cleft palate, and an obturator became needful.

In one instance of cleft palate in a girl, he had fitted her with an obturator when she was eleven years old. She had since married, and her husband had never discovered the fact that she had a cleft palate.

He had seen complete immediate closure of the hard and soft palate in an operation done by Dr Brophy. When one succeeded in closing the hard palate, the remainder of the operation could be done subsequently, or it could be done at a single sitting. That depended on the condition of the patient and the wish of the operator.

DR PECK said he thought that closure of the hard palate was most easily accomplished by the flap operation, although he had never attempted this method in young children, and he believed that it would be increasingly dangerous in patients under two or two and a half years old. Personally, he preferred to do the operation on children after they had reached the age of six or seven years.

In regard to the final improvement in speech he was unable to make any definite statements, as all of his cases were compara-

tively recent In some of them, however, there had been a remarkable improvement in the speech He had operated on eight cases during the past eighteen months, two of the patients being adults, aged, respectively, nineteen and twenty-one years In the first of these two, there was complete healing, with the exception of one small area, which broke down and healed by granulation in a few weeks In the other case there was a complete cleft extending forward through the alveolar process, and complete closure was not attempted at the primary operation, the anterior end being left for a future sitting In that instance complete closure of the sutured part was obtained, but the patient had failed to return for the secondary operation In both of these cases the improvement in speech had been slight when they were last seen As a suture material in all of his cases, Dr Peck said he had used plain silk An important point in the technique was to secure accurate apposition of the parts In the after-treatment he had commenced feeding early and had never resorted to rectal alimentation He had had no mortality, nor had he seen any alarming symptoms follow the operation He believed it was possible to get complete healing of both the hard and soft palates in almost every case In perhaps 50 per cent of the cases a slight secondary operation might become necessary

CONGENITAL PYLORIC STENOSIS

DR JOHN ROGERS presented an infant, born on April 1, 1905 It weighed ten pounds at birth, and it was noted at the time that it had a right inguinal hernia The infant was breast-fed from the outset, but "spat-up" a good deal of the milk On May 25, it first began to vomit constantly soon after every nursing, and this continued and grew worse in spite of lavage, the use of various kinds of artificial foods, etc By the 28th of June the child had become extremely emaciated and a visible peristaltic wave of the stomach was noticed for the first time There was no tumor constipation was quite marked only a slight discoloration was obtained in the water after an enema, the vomiting was not of an expulsive character It was also observed at this time that after one or two attacks of vomiting, the stomach would on washing, be found to contain almost intact, the food taken six hours previously Once the mother noticed that the vomitus was much more than the last feeding.

The diagnosis of congenital pyloric stenosis was made, and the child was operated on June 30. At that time it was three months old, and weighed seven and one-half pounds. The abdomen was opened through a median incision and a simple posterior gastro-enterostomy done by suture according to the Czerny-Peterson method, without any loop. The original intention had been to effect the anastomosis by means of a Murphy button, and Dr. Willy Meyer had loaned him an extremely small button (about one-half the size of the smallest normal Murphy button), which had been especially constructed with such a case in view, but even this small-sized button was found to be entirely too large, and the parts were sutured. The pylorus was found to be about the size of the end of an adult thumb, very hard, and lying well up under the liver, so that it would have been impossible to palpate it. Dilatation would have been impossible, as would also, probably, pyloroplasty.

On the day after the operation, the patient's temperature rose to 103° F, pulse, 160, and the vomiting still continued. On the following day these symptoms had disappeared, and from that time on the child made an uneventful recovery and had gained rapidly in weight and strength.

DR. WILLY MEYER said that about five years ago he was called upon to operate on two cases of congenital pyloric stenosis. The first was that of an eight weeks baby, very much emaciated. A posterior gastro-enterostomy was done with the smallest-sized Murphy button then in the market (cholecystenterostomy), which fitted very closely. The patient did very well for the first two days, then vomiting recurred and the child died. At the autopsy, a mechanical obstruction of the small intestine, due to the button, was found.

In his second case, which was operated on about six weeks later, he employed the suture instead of the button. That case also resulted fatally. In any future case of this kind upon which he might be called upon to operate, Dr. Meyer said he would always resort to suture in preference to the button, and would insist on having the patient removed to the hospital. Both of his operations were done at the patients' homes. For cases of emergency he now possessed "baby buttons," with a diameter of four-eighths and five-eighths of an inch. They are manufactured by Tiemann & Co. The case of the first child thus

operated on was published by Dr S F Meltzer in the *Medical Review*. The specimen is in the Pathological Museum of the College of Physicians and Surgeons

ACUTE PANCREATITIS, CHOLELITHIASIS

DR HOWARD LILIENTHAL presented a woman, twenty-two years old, who three weeks before her admission to The Mount Sinai Hospital, and six weeks after the birth of her first child, had an attack of epigastric pain and vomiting, which subsided in a few hours. Since then she had felt well until the day prior to her admission, when she was seized with a sharp, lancinating pain in the right hypochondrium, radiating downward. She had vomited twice, once bile-stained. The bowels were normal, there was no jaundice. Subsequently the pain radiated over the entire abdomen, but was most marked in the epigastric and right hypochondriac regions.

On admission, May 26, 1905, the abdomen was markedly distended and rigid, so that deep palpation was impossible. There was marked tenderness in the epigastrium, as well as in both iliac fossæ. Vaginal and rectal examinations were negative. Under anæsthesia a mass was palpable in the epigastrium. The patient's temperature was 101.8° , pulse, 120, respiration, 28. The impression made was that of an individual suffering from perforation of one of the viscera, with peritonitis. The easily palpable epigastric mass led to the belief that the case was one of perforated gastric ulcer with considerable effused lymph, and probably adhesions with neighboring viscera.

Operation—May 28. When the peritoneum was opened through a median incision above the umbilicus, bloody fluid escaped. The fat of the omentum and parietal peritoneum showed many areas of necrosis, and, to a lesser extent, the subcutaneous fat. The pancreas was enlarged and hard, especially the head. After closing the median wound an incision was made through the right rectus in order to reach the gall-bladder. Aspiration of the pancreas through this opening was negative. The peritoneum of the gall-bladder was sewn to the parietal peritoneum, and a purse-string suture passed about the fundus of the gall-bladder. On incision, much bile-stained mucus escaped, and many small granular stones, as well as two larger (pea-sized)

ones A tube was inserted into the gall-bladder for drainage, and gauze packed about the visceral opening

The post-operative progress of the patient was uneventful There were occasional complaints of sharp pains in the abdomen, and the temperature during the first week ranged between 100° and 102° F, the pulse, between 85 and 110 There was a copious discharge of bile for the first two weeks The patient was discharged cured on June 27, with a small superficial sinus

Microscopical examination of the omental fat removed at the time of operation showed fat necrosis The material draining from the gall-bladder was examined by the physiological chemist of the hospital, for trypsin, steapsin and pancreatic rennet, with negative results Examination of the stools was negative for blood, positive for bile and free fat

When this patient was examined on October 22, 1905 she appeared to be in normal health The abdomen was somewhat distended by gas in the intestines, but there were no symptoms of disturbed digestion The cicatrix was small and firm

DR JOHN F ERDMAN said he had recently operated on two cases of acute hæmorrhagic pancreatitis The first, on the tenth day of disease, which resulted fatally, was not recognized until the autopsy, when two very small calculi were found in the pancreatic duct They were soft, and apparently gall-stones At the time of the operation, two hundred and twenty stones had been removed from the gall-bladder The second operation was done eleven hours after the onset of the pain, two weeks ago, and the patient was apparently on the road to recovery

DR LILIENTHAL, in speaking of cholecystotomy in dealing with acute pancreatitis, said that unless the pancreatic fluid was found there upon examination, he did not see how the mere drainage of the gall-bladder did any special good, excepting possibly in those rare cases where immediate relief was afforded by removing a stone from the common duct He thought it was the puncture of the pancreas that proved beneficial in those cases, and not the cholecystotomy

DR WOOLSEY said that he did not think it necessary to puncture the pancreas He had had three cases that recovered without puncturing the pancreas, limiting himself to opening and washing out the peritoneal cavity In all of them there was profound collapse He had expected to do a secondary

operation, but it proved unnecessary. He had not touched the gall-bladder as the time required could not be given owing to the collapsed condition of the patients.

DR LILIENTHAL said that in two out of three cases upon which he had operated he did not wash out the peritoneal cavity, and both cases got well.

END TO END ANASTOMOSIS FOR CARCINOMA OF THE SPLENIC FLEXURE

DR LILIENTHAL presented a woman twenty-two years old, who, when she came under his observation, early last June, complained of vague pains in the left hypochondriac region, and palpation in that region revealed a fairly hard mass, about the size of an adult fist. The patient gave no intestinal symptoms. The urine was negative, and blood examinations failed to give any clue as to the nature of the trouble. She stated that at the onset of her trouble, she had had occasionally attacks of abdominal cramps. Her general health had deteriorated considerably. The tumor felt like a large movable kidney.

An exploratory operation was decided on, and the left kidney was exposed, and proved to be normal in size and position. The growth that had been felt proved to be a carcinoma of the splenic flexure of the colon. There were a number of firm adhesions to the stomach which had to be removed by ligation. The involved section of the gut was then removed, and an end-to-end anastomosis effected by suture.

There was slight intestinal leakage for a few days after the operation, but this was at no time alarming. The result of the operation was very satisfactory, and the patient is now enjoying excellent health, and has gained considerably in weight.

DR LILIENTHAL said the incision he had employed in this operation was the one commonly resorted to in exploring the kidney, and while it was unusual in a case of this kind, it gave excellent access to the tumor, and the subsequent drainage was perfect. In this connection, he stated that Dr Moschowitz had just called his attention to a reference by Alfred Neumann in a recent number of *Langenbeck's Archives* giving the report of a case of resection of the colon through the usual incision made for exposure of the kidney.

A microscopical examination of the growth in this case, Dr

Lilienthal said, was made by Dr Libman and proved it to be an adeno-carcinoma

RESECTION OF RECTUM FOR SYPHILITIC STRICTURE, WITH END TO END ANASTOMOSIS

DR JOHN A HARTWELL presented a negress, thirty-eight years old, who was admitted to the Lincoln Hospital about the middle of March, 1905. She gave no past history of syphilis. Five years before she had been operated on at a New York hospital for a fistula-in-ano which had never healed up. Examination showed a tumor of the rectum, situated about two and a half inches from the margin of the anus. It was hard and firm, and could be distinctly felt through the vagina. The tumor surrounded the gut, the calibre of which was just large enough to admit the tip of the finger, and the upper margin could not be felt. Upon examination it proved to be a simple chronic inflammation, without any evidence of new growth. A diagnosis of syphilitic stricture of the rectum was made, and the patient was advised to submit to a colostomy, but she refused.

On March 28, 1905, with the patient in an exaggerated knee-chest position, a median incision was made from the fifth sacral vertebra down over the coccyx to the anus. The anal opening was then closed with a purse-string suture, and the rectum entirely freed from its bed for a distance of about six or seven inches from a point two inches above the anus. Two clamps were then applied above the tumor and the section made between them with the actual cautery. After dissecting out the mass, the gut was divided between clamps just below the tumor and the distal end of the upper segment of the gut was brought out through the anus, and sutured to the skin. The sphincters were not incised.

About five days after the operation, sloughing of the tissues along the line of suture occurred, resulting in an open space of about one inch between the upper and the lower segments of the gut. A vaginal sinus occurred, and the bowels moved both into the vagina and into the posterior opening. The vaginal sinus closed within two months, and in June, 1905, about three months after the operation, the patient had a normal passage that would admit the largest bougie without any difficulty. She

then went into the country and neglected to keep the passage dilated, and three weeks ago, when she was admitted to Bellevue Hospital, a stricture had re-formed which was so tight that it would scarcely admit the index finger. This was dilated under anæsthesia, and the patient now had a fairly normal passage.

DR F KAMMERER said that his experience with resection of the rectum for stricture had not been very encouraging although no deaths had followed operative interference. In a number of such operations that he had done the stricture had recurred. The operation itself is generally a much more difficult procedure than a resection for carcinoma, owing to the extended cicatricial contraction in the perirectal spaces. Of course, in these cases, as well as in operation for cancer, an artificial anus should always be established. There can be no question that one does occasionally get complete union of the resected ends of the bowel without preliminary colostomy, but these instances in the speaker's experience, are rare, as the sutures generally give way at the posterior circumference, resulting in a sacral fecal fistula above the anus, which is very difficult to close. For cancer of the rectum resections had the further disadvantage of forming recurrences. The speaker said he was well aware that cancer of the rectum, under equal conditions, was less likely to recur after removal than cancer of other organs, but it had been his experience that, when it did recur, it was generally in the line of suture after a resection. The speaker, therefore, believed that resection of the rectum would be viewed in a less favorable light than it had been by surgeons some eight or ten years ago.

DR WILLY MEYER said that Kraske had recently reported quite a series of cases where the result of resection of the rectum for cancer had been most excellent, and he had again highly recommended the operation.

DR HARTWELL, in closing, said he agreed entirely with Dr Kammerer, and in a paper which he had read before the Society last spring, he had made the statement that a colostomy should always be done before attempting a resection for either stricture or carcinoma. In the case he had just reported the patient had absolutely refused a colostomy. He was not hopeful that the stricture would not recur as extensively as before the operation though at the present time it was of soft tissue and could be easily dilated.

RESECTION OF THE COLON

DR OTTO G T KILIANI presented a specimen removed from a woman, twenty-five years old, who was admitted to the German Hospital on June 12, 1905. She stated that six weeks before admission she had begun to suffer from discomfort and colicky pains in the epigastric and right hypochondriac regions, and that at certain times a tumor appeared and disappeared in the middle of the abdomen. This tumor was hard, but not tender. She also complained of vomiting after meals, loss of appetite and weight, and chronic constipation. For five weeks she had been an inmate of another hospital, where she was treated for a possible ulcer of the stomach.

When Dr Kiliani examined her, there was slight resistance in the epigastric region, which he thought was possibly due to a carcinoma of the colon. Upon opening the abdomen, he found a tumor, which proved to be a carcinoma of the colon, and in order to remove it twelve centimeters of the gut were resected.

The patient has gone back to Switzerland and is, according to a letter received two weeks ago, entirely well so far.

RESECTION OF INTESTINE FOLLOWED BY END-TO-END ANASTOMOSIS

DR ELLSWORTH ELIOT, JR, read a paper with the above title (for which see page 92).

DR CHARLES N DOWD said that the particular section of the intestine that was to be resected was a matter of much importance. In the region of the colon it became necessary, at times, to deal with a very troublesome condition, namely, the peritoneum, instead of lying close to the intestinal wall is separated from it by a thick deposit of fat. Even in the sigmoid flexure, where there is a distinct meso colon, the peritoneum may only be in contact with the muscular layer through one quarter of the circumference, a layer of fat one-half inch or even an inch in thickness separating it elsewhere. It is very difficult to obtain good union in this part, hence, if the end-to-end method is used, it is wise to insert enough gauze to provide for possible leakage. He had recently operated on three cases of sigmoid carcinoma in two of which he had used the end-to-end method—in the third a lateral anastomosis.

DR WILLY MEYER said that in the early diagnosis of cancer of the large intestine the history given by the patient was very important. One symptom that could often be elicited early, was a peculiar sensation within the abdomen, a stiffening or feeling of contraction, as though from an effort to overcome an obstruction. Gurgling was another symptom, often made out by auscultation. Actual palpation of the tumor was certainly very difficult in many instances. If successful, operation frequently was too late. A satisfactory examination could only be made under a general anæsthetic, which ought to be more frequently resorted to in suspicious cases. If the symptoms were pointing to a malignant growth, and if the patient was steadily losing in weight and health, an exploratory incision should be insisted on.

DR GEORGE WOOLSEY recalled two cases of carcinoma of the splenic flexure which came to him after obstruction had occurred. No previous symptoms could be elicited, and the only history obtainable was that one admitted that after he had drunk too much he had had stomach-ache which was relieved by a hot mustard foot-bath.

DR HARTWELL said that at the recent meeting of the New York State Medical Association, Dr James P Tuttle had read a paper upon carcinoma of the intestinal tract, in which he had referred to the great frequency of the disease, especially in the large intestine, and he had quoted statistics to show that if the present increase went on, carcinoma would eventually cause more deaths than tuberculosis. The general profession had thus far failed to appreciate the importance of an early diagnosis in cancer of the lower gut, and the omission of an ordinary rectal examination was the rule rather than the exception. Only three weeks ago, Dr Hartwell said, he saw a patient with a carcinoma of the upper part of the rectum, just above the reach of the finger, although it could be plainly seen with the proctoscope. That patient had been under treatment by a number of physicians for eighteen months, and had been sent to Colorado for supposed tuberculosis.

DR ELIOT, in closing, said he would hesitate to introduce a large drain in these cases in order to prevent leakage, as he would be afraid that its withdrawal might tear open the suture line. He preferred a small intra-peritoneal gauze drain reinforced by the introduction of a rubber tube by an assistant to a point within the rectum beyond the suture line.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, October 2, 1905

The President, HENRY R WHARTON, M D , in the Chair

STAB WOUND OF THE LUNG—TREATED BY SUTURE

DR JOHN H JOPSON presented a young man, who, six weeks before, had been stabbed in the fifth interspace in the anterior axillary line of the left side. When the man was seen there was, in addition to signs of a developing pneumothorax, external hemorrhage, severe enough to make its active control desirable. The wound was enlarged, a part of the sixth rib resected, and inspection made of the pericardium and diaphragm, both of which proved to be uninjured. Examination of the collapsed lung revealed a cut, one and one-half inches long, as the active site of the hemorrhage. The lung was grasped by forceps, drawn out, and the hemorrhage controlled by a continuous catgut suture. The pleura was drained by means of a tube and gauze inserted in the original wound and also posteriorly in an opening made for that purpose. Pyocyaneous infection occurred and later pneumonia developed but the patient recovered. Now, at the end of six weeks, there remains a discharging sinus leading to a contracting cavity of moderate size.

In another case seen recently, there were five wounds in the back, one penetrating the pleura. In that instance Dr Jopson did not resect a rib but simply plugged the wound with gauze. Symptoms similar to those in the present case developed. After two days the gauze was removed to allow the blood to escape. The wound was then replugged for two days when the drainage tube was inserted. The patient was recovering. Dr Jopson is aware there is a great difference of opinion as to the control of hemorrhage and also regarding other points in the management of these

wounds, in the case shown, the control of hemorrhage seemed to be the imperative indication

DR ROBERT G LE CONTE said that several years ago he had discussed before the Society the subject of penetrating wounds of the lung, and that he had had no reason since to change the opinions then expressed. His conclusions at that time were that when a wound of the lung is causing only slight hemorrhage, the external wound should be closed with gauze and the physical signs of bleeding watched for. When the hemorrhage is more marked, a small drainage tube should be inserted into the pleura and the admission of air regulated according to the difficulty of respiration in the patient. When the hemorrhage is large and the symptoms alarming, open the chest and insert a large drainage tube, so as to form a rapid and complete pneumothorax, at the same time, when necessary, give salt solution intravenously. When this fails to control the hemorrhage, as shown by the increasing failure of the pulse, it becomes necessary to resect one or more ribs and deal radically with the bleeding vessel, either by ligation, suture, or packing. In severe hemorrhage from the lung the first object is to get pressure on that lung, and this is best accomplished by opening the chest and forming a pneumothorax. The admission of air to the pleura is under perfect control, and it can be increased, diminished or stopped at will, should untoward symptoms appear. Besides permitting a collapse of the injured lung and bringing direct pressure upon it, the presence of air favors the formation of a clot in the severed vessel. This procedure in his experience has been sufficient to control a very alarming hemorrhage from the lung, and he had not yet had a case where resection of a rib was necessary, with suture of the lung.

GASTROENTEROSTOMY FOR GASTRIC ULCER

DR FRANCIS T STEWART reported the following case to call attention again to the difficulty sometimes encountered in differentiating between carcinoma and extensive perigastritis the result of chronic ulcer of the stomach, and to emphasize the advisability of exploratory laparotomy in cases in which intra-abdominal malignant disease is believed to be present. In the upper abdomen a palpable carcinoma so often means the time for cure has passed, that some physicians counsel soothing medical treatment rather than surgical interference unless there are indications for some

palliative procedure One can rarely be absolutely sure, however, that the condition is malignant, and right is on the side of the surgeon who explores such cases with the belief that he is dealing with an inoperable cancer, but with the hope that he will find gastric ulcer, or gall-stones, or chronic pancreatitis, or some other condition equally amenable to treatment, or, that in the event of malignancy, he will find the disease removable or at least so situated as to permit of some measure which will relieve the patient's suffering His own patient, a man aged forty-two years, was admitted to the Polyclinic Hospital in September, 1904 He had suffered with indigestion for eight years, during which time, at irregular intervals, he would have attacks of vomiting which would relieve the almost constant pain he experienced in the epigastrium Two years ago his appendix was removed by another surgeon without giving the hoped-for comfort Three or four days before admission he had vomited a mouthful of blood, and this was the only time as far as he could remember During the last year he has lost 77 pounds in weight At the time of examination he was lemon-colored, markedly emaciated, vomiting all food, and suffering constant pain in the upper part of the abdomen Beneath the upper part of the right rectus lay an immovable tender mass about the size of an adult fist The stomach contents showed HCl 0.73 per cent, total acidity 51, and the presence of lactic acid The stomach was not distended owing to the discomfort produced Blood examination revealed hemoglobin 45 per cent, leukocytes 5,000 and red cells 3,000,000 Operation was performed September 30, 1904, disclosing a hard tumor involving the pylorus and adherent to and apparently infiltrating the pancreas, liver, colon and anterior abdominal wall The adjacent lymphatic glands were swollen and indurated With some difficulty a posterior gastroenterostomy without the loop and without the button, was performed For six days following the operation the patient vomited large quantities of dark fluid which during one twenty-four hours amounted to 172 ounces He refused a second operation and was thought at one time to be dying The vomiting ceased rather suddenly but recurred at intervals for four weeks and then stopped permanently The patient is now absolutely well, eats all sorts of food without any distress, has gained 62 pounds in weight, and no tumor can be detected on careful palpation of the abdomen

DR JOHN H GIBBON recalled an exactly similar case upon which he operated two years ago. The mass involved the pylorus and was as large as a fist. He performed gastroenterostomy with the idea of later doing a pylorotomy or partial gastrectomy, but as in Dr Stewart's case the patient went on to perfect recovery and is now perfectly well. Both these cases show the advisability of operating even in the presence of a large mass.

RECOVERY AFTER EXTENSIVE FRACTURE OF SKULL

DR WILLIAM L RODMAN showed a patient upon whom he had operated two weeks previously for an extensive fracture of the skull. The man was struck with a beer bottle thrown with great force which mashed in the right side of the frontal region. When seen he was conscious, with a pulse of 62 and respirations 20. The fracture involved both the vault and the base of the skull and extended into each frontal sinus. Large fragments of the skull were removed and as the jagged bone had torn the meninges, they were further incised and the brain inspected and irrigated. A large blood clot was found but this had caused only slight paresis of the right arm. The frontal sinuses were packed to prevent infection. The patient unexpectedly made a prompt and uneventful recovery.

A TRANSVERSE INCISION FOR THE REMOVAL OF THE APPENDIX

DR GWILYM G DAVIS read a paper on this subject (for which see page 106).

DR WILLIAM L RODMAN agreed that McBurney's operation is anatomically correct and usually satisfactory in clean cases, in pus cases it is inadequate and should not be employed. It would seem that any transverse incision is more liable than oblique ones to be followed by ventral hernia though Dr Davis has not found this to be the case in the operation he advocated.

RADICAL CURE OF DIRECT INGUINAL HERNIA

DR GWILYM G DAVIS read a paper with this title (for which see page 111).

DR WM L RODMAN was much interested in Dr Davis's statements regarding direct inguinal hernia. He believes the

frequency of this type is greatly over-rated by anatomists, instead of being in the ratio of 1 to 5 as usually stated, he considers 1 to 25 more nearly correct. In more than 300 operations for hernia he has rarely seen the direct form, though recently he operated upon two cases in one day, one of them being a hernia of the bladder, the only one he has ever seen. He has never encountered the conjoined tendon as a covering of a hernia and does not see why it should be so, it being very easy for the gut to slip around the muscle and, going in the direction of least resistance, carry with it the transversalis fascia instead, the former condition may occur in persons with great muscular relaxation but does not take place usually. Dr Rodman made this point in a lecture several years ago when Dr Coley was present and this experienced operator agreed that the conjoined tendon was rarely, if ever, present as a hernial covering. Dr Rodman finds the transplantation of the sheath of the rectus, after Halsted's method, very satisfactory and is resorting to it with increasing frequency and confidence in cases of relaxed musculature. He does not operate on direct hernia with the same confidence that he feels regarding the indirect form but considers Halsted's method of transplanting the anterior sheath of the rectus and also using the cremaster muscle as distinctly strengthening the wall. Operated upon in this way, direct inguinal hernias will seldom recur. He has had but one recurrence of a direct hernia in the comparatively small number he has operated and this was reoperated by Halsted's method four years ago and remains perfectly cured. The patient is a motorman, leads a very active life, and has given the cicatrix sufficient test. Recurrence, in any hernia, is rare after one year.

DR DAVIS, in closing, said the experience of various surgeons differed greatly as to the proportion of direct to indirect hernias. The number of the former is not large but, though he does not see many of them, he operated upon five hernias in four patients within a short time during the past winter. As to the occurrence of hernia in the transverse incision for appendicitis, in the case of the short incision, the inner half, three-fourths inch, is blocked by the rectus muscle and the outer half by the transversalis and external oblique. When the larger incision is employed, the inner two inches is blocked by the rectus and the outer three inches by the internal oblique and the transversalis which are cut in the direction of their fibers. The only aponeurosis divided diagonally

nally to its fibers is that of the external oblique and it seems to heal strongly and satisfactorily

APPENDICEAL ABSCESS POINTING IN THE RIGHT SIDE OF THE SCROTUM IN A PATIENT FREE FROM HERNIA

DR ROBERT G LE CONTE reported the case of a man, aged twenty-one, colored, who was admitted to the Pennsylvania Hospital on the morning of July 17, 1905, with the following history Seven days previous to admission he was seized with pain in the abdomen and vomiting Fever developed soon afterwards, and the abdominal pain continued, with rigidity and tenderness over the appendix The night before admission the pain suddenly extended to the right scrotum, with the appearance of a tumor in this region

On admission the temperature was 102° , pulse 104, respirations rapid, facial expression pinched, mucous membranes blanched The abdomen was slightly distended and tympanitic, with marked rigidity on the right side and exquisite tenderness over the whole lower right quadrant, where a diffuse mass could be made out, the feeling of tumor extending down to the right inguinal ring The external inguinal ring and upper portion of the scrotum were filled with a tumor the size of an orange, the overlying skin being reddened and edematous This swelling was tense, dull, without fluctuation or impulse on coughing, and did not diminish with taxis No history could be elicited of a previous hernia, and as the man had been in bed for a week the probability that this mass might be inflamed omentum was remote There was no obstruction of the bowels, they having been freely moved the night previous It was therefore thought that a patent funicular process had existed since birth, into which an appendiceal abscess had ruptured

Ethyl chlorid and ether were used for narcosis, and a three-inch incision was made over the scrotal mass, extending from the external ring downwards As the dissection proceeded a thick, inflammatory capsule was opened and a large quantity of pus evacuated with a typical appendiceal odor The finger readily passed through the inguinal canal into the abdomen, but only a rounded channel could be felt and no portion of the appendix was within reach Owing to the precarious condition of the patient further operative procedure was not considered A drainage tube

was inserted through the internal abdominal ring into the abdomen, and a portion of the wound closed with silkworm gut sutures.

The following day the patient's condition was still very serious, pulse rapid and weak, temperature 102.4, discharge on the dressings was very free. He responded fairly well to free stimulation. The day following his condition had somewhat improved. From then on convalescence was fairly rapid, although the temperature remained elevated for a week. The wound gradually closed, until only a small sinus resulted, with persistent discharge.

On August 23 the patient consented to a second operation for the removal of the appendix. This was done by Dr Hutchinson.

Ethyl chlorid and ether narcosis. Incision was made along outer border of right rectus below umbilicus, and was gradually prolonged until the internal abdominal ring was exposed. On opening the abdomen the intestines were found matted together, and after some difficulty the cecum was recognized and in part isolated. What appeared to be the stump of a sloughed-off appendix was caught and ligated, but later, after breaking up still more of the adhesions in an attempt to trace the sinus to the scrotum, the real stump of the appendix was found in a retro-cecal position. It was patulous and oozing a small amount of fecal material. The stump was tied, inverted with a pursestring suture of chromicised gut, followed by a few Lembert interrupted sutures. The tip of the appendix, which had sloughed off, was found still further posterior to the head of the cecum in an opening through the pelvic peritoneum, the cavity resembling somewhat the sac of a hernia. On removing it a fecal concretion about as large as a bean was also found in this pouch. A probe entered in the scrotal sinus passed directly into this pouch, the sinus being entirely posterior to the pelvic peritoneum, and in that sense extra-peritoneal. The sinus was curetted and the sub-cecal region drained with iodoform gauze. The wound was partly closed.

An uninterrupted recovery followed this operation, and by the 10th of September the wound and sinus had entirely closed, and on the 13th the patient was discharged cured.

An interesting and unexpected feature in this case was the perforation of the pelvic peritoneum with the burrowing of the

abscess outside of the peritoneal cavity, the pus finding its way into a previously normal inguinal canal and scrotum. In this case there was no history of a hernia, nor did the operation show that one had previously existed. It seems strange that the pus after having broken through the pelvic peritoneum and reached the psoas muscle—did not follow this muscle and point in the usual position for psoas abscess, instead of entering a normal inguinal canal.

DR JAMES P HUTCHINSON said the most interesting point to him regarding the case was his mistake of opening too low down for the appendix, though this part was relatively free from adhesions as compared with the upper part. The appendix was difficult to bring up and he believes he tore the organ from its cecal attachment during the attempt at removal. When the other portion was removed it was patulous, hence the belief that the concretion came from the appendix and not from the cecum.

STONE IN THE CYSTIC DUCT

DR CHARLES F MITCHELL presented a specimen obtained from a patient whose gall-bladder contained seventy-five gall-stones and a quantity of pus. The cystic duct was dilated as was also the hepatic duct, the latter readily admitting a finger. A number of stones were removed from the hepatic duct. Following operation the patient developed many complications and finally died. At autopsy the cystic duct was found to be almost occluded by a faceted stone which was probably left in the hepatic duct at the time of operation.

DR JOHN H GIBBON found the patient referred to by Dr Mitchell in his ward when he went on duty, the gall-bladder wound was still draining but in a few weeks it entirely closed and there were no symptoms referable to the liver. A rectovaginal fistula which had developed shortly after the gall-bladder operation was the important feature at this time. Dr Harte regarded it as the result of numerous turpentine enemas, at one time a spoon had also been used in removing hardened feces. Pure pus was discharged from the fistula about one week after Dr Gibbon took charge and in a few weeks this was repeated. At these times there was a chill and rise of temperature and the patient developed a low sepsis. Dr Gibbon concluded there was an abscess cavity in the abdomen, originating in the appendix or a

tube, and emptying into the bowel As Dr Mitchell found the appendix normal when he operated, that organ seemed to be excluded Because of the infiltration about the fistula a satisfactory examination of the tubes could not be made Exploratory operation was possibly too long deferred but the abdomen was finally opened The peritoneal cavity was full of light, straw-colored fluid The tubes and ovaries were slightly adherent to the surrounding structures but no abscess was found The rectum was adherent to the uterus and attempt to separate them resulted in the finger passing into the rectum In closing the fistula, two other small openings into the vagina were found, the rectum was an unrecognizable cavity containing a quantity of pus The patient was practically pulseless when operated upon and died in a few days of peritonitis At autopsy it was found that three or four inches of the rectum in the hollow of the sacrum had sloughed A small tract extended upward along the sheath of the psoas muscle but there was no distinct cavity at the upper end No other pathological condition was found although a careful search was made Dr Gibbon believes that the lower three or four inches sloughed because of the injury done by the turpentine

AN UNUSUALLY LARGE PREPATELLAR BURSA

DR JOHN H GIBBON presented this specimen which before removal was as large as the patient's knee It was of several years' duration and had never been tapped The work of the patient had not required the kneeling position Portions of the bursa are so hard as to suggest the presence of calcareous material but the exact nature has not been determined as the sac has not been opened A great deal of redundant skin was removed with the bursa The bursa was dissected away from the patella without rupture and was shown after it had been hardened in formalin solution

CORRESPONDENCE.

SUTURE OF RUPTURED BICEPS TENDON

EDITOR ANNALS OF SURGERY

IN ANNALS OF SURGERY, Vol XLI, 1905, p 756, I published a short paper on Rupture of the Tendon of the Biceps Muscle and reported a case of my own Inasmuch as operation for this injury is very rare (there only having been 4 cases reported up to that date), I think it may interest surgeons to know one further fact in reference to my patient The operation was done on Dec 18, 1904 He has just called to see me to state the following facts He has resumed his athletic life, and among other feats he frequently swings from one trapeze to another over a distance of seven feet Recently, on two occasions, he missed catching the second trapeze with his left hand and the entire weight of his body, about 120 pounds, with its momentum in flight through the air was borne by the right arm alone, the arm itself being in flexion No injury or inconvenience of any kind has followed these two accidents It seems to me, therefore, proof of a very firm union following the overlapping and suture

WILLIAM W KEEN

PHILADELPHIA, December 20, 1905

RUPTURE OF INTESTINE

EDITOR ANNALS OF SURGERY

IN the November number of the ANNALS OF SURGERY Dr R P Campbell furnishes an interesting article upon Rupture of Intestine, in which he enumerates twelve cases of successful operation for this injury, as culled from English and American journals since the year 1894 I would like to call attention to a case of my own, published in the January 23d number of the *New York Medical Record*, for 1904, under the title of "Two Cases of Abdominal Traumatism," and to place on record a second opera-

tion for a similar condition. These two cases constitute the total number upon which I have operated. A man, seventy-four years of age, generally healthy, who had had a reducible inguinal hernia on each side for some years, while lifting a 75-pound cast-iron drum of a cooking-stove into position was seized with an agonizing pain in the belly, which caused him to drop on the floor and lie there writhing. Five hours later he was seen by me. I found a somewhat under-sized spare man of fair muscular development, with large inguinal rings, but no bowel in the scrotum. The abdomen was not found distended, but its walls were hard and the muscles rigid. Tenderness was felt on palpation all over the abdomen but was especially marked in the left lower quadrant, at its upper part. The bowels had moved the day before. P 80, T 90°.

Two hours later, after removal to hospital the abdomen was opened in the median line below the navel. Turbid serous fluid escaped, no bowel in inguinal canals. One or two congested and somewhat distended coils of small intestine were now allowed to come out through the wound. Some lymph seen on them, and at one point a small perforation about an eighth of an inch in diameter. This opening was closed by two rows of silk Lembert's sutures, and after sponging off the coils of bowel and returning them, the abdominal wound was united with through and through silkworm gut sutures. An uncomplicated recovery followed.

There was no evidence of the intestine at the point of rupture being in any way weakened by pre-existing disease, so as to predispose to its bursting at that part.

A B ATHERTON, M D

FREDERICTON, N B, December 22, 1905

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ACUTE NASAL CATARRH

The conditions obtaining in acute nasal catarrh are especially those of an inflammation of any mucous membrane. First an engorgement of the capillaries, then an exudation of serum into the tissues, then further exudation on the part of the mucous or serous membrane.

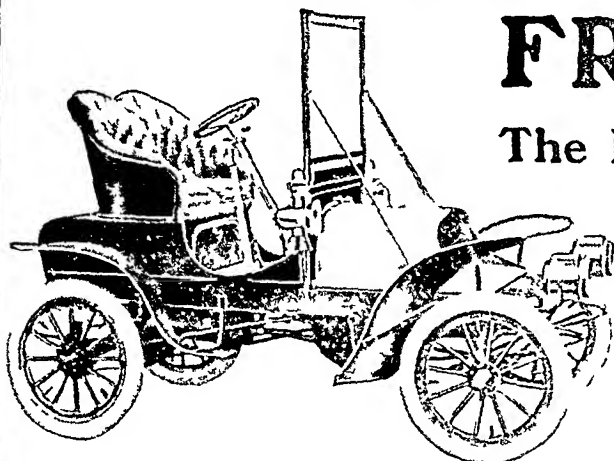
To attempt to terminate the trouble or alleviate the discomfort by an astringent or any wash of an acid nature is simply to temporarily lessen the secretion without in any degree reducing the congestion or stimulating the circulation, thus actually rendering the condition worse than before.

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BY THE STACK

During a recent visit to the R. E. Dietz Company, New York City we asked them if they ever heard from their customers regarding the "Dietz" Driving Lamp. Their answer was the production of a huge stack of letters and postals, a few of which we copied. They came from everywhere.

Dr. JAMES KIRCHNER, Millinburg, Pa., writes — "I purchased a pair of your Union Driving Lamps last February, which have given the best of satisfaction. In fact, they are the best I have ever used, and I have used a number of different kinds, having practiced medicine in this section for the last thirty years, with plenty of night driving."

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A PECULIAR FORM OF TRAUMATIC (CHEMICAL) CONJUNCTIVITIS

By A. M. HUTTON, M. D., Naxxarre, Mich.

Some miners employed in sinking a shaft near here encountered numerous streams of sulphur water. Though a careful analysis of the water has not been made it is sufficient for me to state that it gives rise to an acute conjunctivitis. The pain is most excruciating, and can be relieved only by the use of cocaine, and even cocaine is useless unless preceded by ADRENALIN CHLORIDE.

My practice has been to use ADRENALIN CHLORIDE, 1-2000, and to follow this with cocaine, 2 per cent. solution, and then to give the patient a boracic-acid-and-cocaine solution to be used until all symptoms have disappeared.

The point in favor of ADRENALIN CHLORIDE is this: Cocaine will *not* relieve this condition unless preceded by ADRENALIN CHLORIDE.

COUGH

By FRANCIS W. CAMPBELL, M. A., M. D., D. C. L., L. R. C. P., London, Dean and Professor of Medicine, Faculty of Medicine, University of Bishop's College.

It is not always an easy matter to decide upon the cause of a cough, and, therefore, sometimes a difficult matter to relieve or cure it. Many patients go about their work, appear in excellent health, and yet suffer more or less from a persistent irritating cough. Examination of the chest in these cases does not show anything abnormal in the respiratory mucinæ. Examination of the throat often reveals an elongated uvula which is frequently cured by a simple astringent guggle, and the cough disappears. Again, examination reveals congestion of the vocal cords, and a soothing inhalation of a teaspoonful of a compound tincture of benzoin in a teacup of hot water frequently causes the cough to be relieved in a short time. But the general practitioner, especially during the winter or spring, meets with a great many cases of cough, the cause of which he cannot fathom. He calls it an irritating cough, but the cause of the irritation is a mystery. Experience will soon show that it is irritating to both the patient and physician. To the latter because he finds that it continues in spite of his best efforts, and at last the patient drifts from one physician to another without getting relief. Eventually he takes his case in his own hands, and buys from druggists some of the numerous cough remedies they have for sale. Still no relief, and he finds his stomach thoroughly out of order because opium has been a constituent of the quick remedies he has taken. Nature, the *vis medicatrix naturæ*, possibly comes to his aid, the cough disappears, but no thanks to the doctor or his own prescribing. This is a brief sketch of what I know occurs to hundreds of physicians, as it certainly has to me.

Among the late remedies for this class of cases is heroin, and it certainly has proved a valuable addition to our *materna medica*. There are many combinations in use of which heroin is the chief constituent. Some, in my opinion, are not to be recommended for general use. What is needed is a safe and efficient preparation whose action is positive and definite. Such a combination we have in Glyco-Heroin (Smith), made by Martin H. Smith Co., of New York, to which my attention was drawn about a year ago. Each drachm of this mixture contains heroin gr. 1-16, ammonia hydropnos, hyoscyamus, white pine bark, balsam tolu, glycerine, and 51

EXODIN

In a treatise "On Exodin as a Purgative for Puerperal Women," Dr Otto Schmechel records an extensive experience with exodin in the clinic of Privy Councillor von Winckel at Munich. It was given to 100 subjects, mostly young and healthy puerperæ whose confinements had been normal but who had no passage for three days after delivery. They all took it without any trouble whatever, there was no difficulty in swallowing the tasteless suspension. Never was there disgust or nausea.

The results were in accord with those of Prof Ebstein and Dr Stauder, passages were procured without any trouble whatever. The dose of 22½ grains, however, which they found to be always sufficient, gave some failures, and to assure certainty of effect in these puerperal cases it was necessary to give a dose of 30 grains. Once the drug caused some tenesmus and a thin evacuation, but no other case of diarrhoea was observed. The stools were sometimes formed, but usually mushy and brownish. They never contained mucus or any other indication of intestinal irritation.

Often there was another stool on the same or following day. The intervals between administration and defecation were somewhat lengthy. The earliest passage noted was 10 hours later, and this was only occasionally. Usually it took 18 to 20 and even 24 hours.—*Abstracted from Inaugural Dissertation, Munich, 1905*

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NOTES ON A CASE OF PERIMETRITIS

By HUKAM CHAND, C M S,
Surgeon Delhi Hospital, Delhi, India

I was called to see a female patient in the city on October 12th, 1904. On arrival I found her with fever, temperature 102°, tongue coated, pulse rapid, bowels costive, urine scanty and high-colored, pain and tenderness over the hypogastric region as well as in both iliac fossae, vagina hot (as told by native *dhar*) but no discharge. On palpation the uterus was found hard, and on inquiry it was found that the present complaint was due to abortion and exposure to cold. I diagnosed the case as perimetritis associated with ovariitis and prescribed

- (1) Calomel gr $\frac{1}{2}$ One every three hours
- (2) Antikamnia & Heroin Tablets One every four hours
- (3) Turpentine stupes over the seat of pain

Liquor Morphia, 15 minims at night, if no sleep

Oct 13th —Pain less than before, had a good sleep for four hours. Continued the same treatment

Oct 14th —Pain considerably less than the previous day, had good sleep without morphia

Oct 15th —Pain considerably less, patient could walk with the aid of stick. Good sleep. Continued same treatment, but stopped turpentine stupes

Oct 16th —Very slight pain remaining, patient weak, otherwise well. Stopped calomel, prescribed castor oil, oz 1, and continued Antikamnia & Heroin tablets as before

Oct 17th —No pain at all. Bowels moved twice. Prescribed tonic mixture. Patient getting well

REMARKS.—In my opinion the recovery of this case was due to the analgesic and antipyretic properties of Antikamnia & Heroin tablets. They are worth a trial in such conditions.—*Practical Medicine*, March, 1905, Delhi, India

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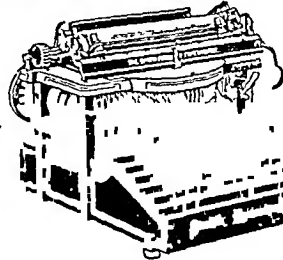
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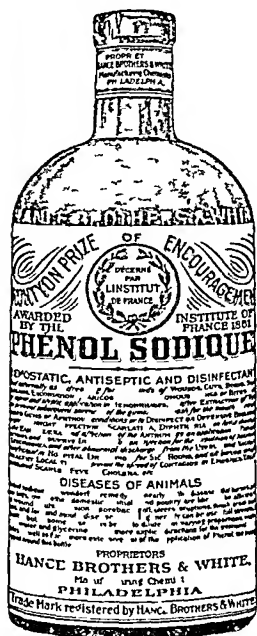
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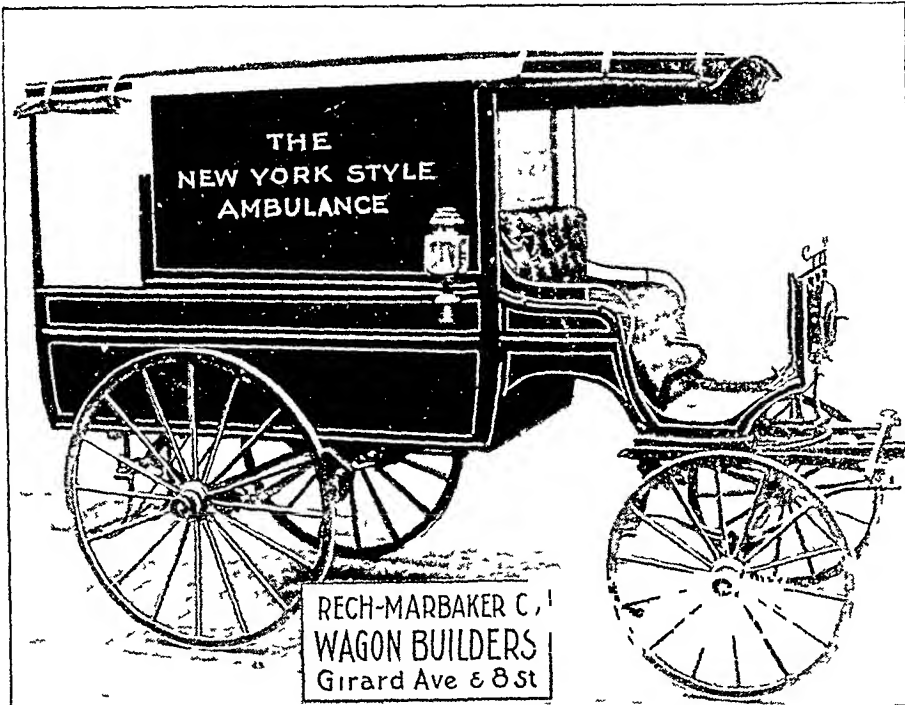
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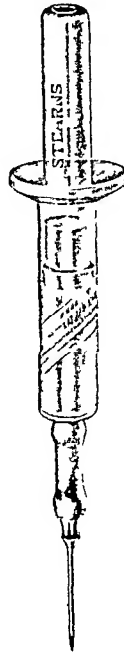
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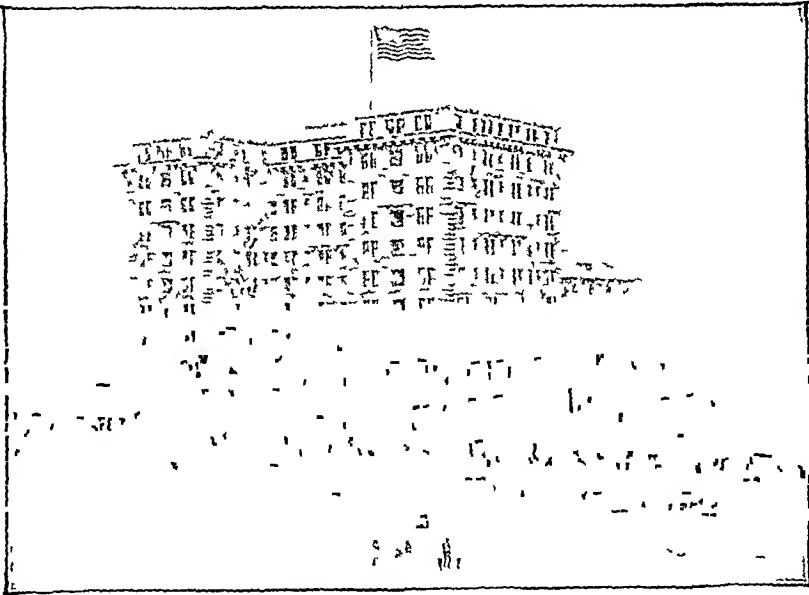
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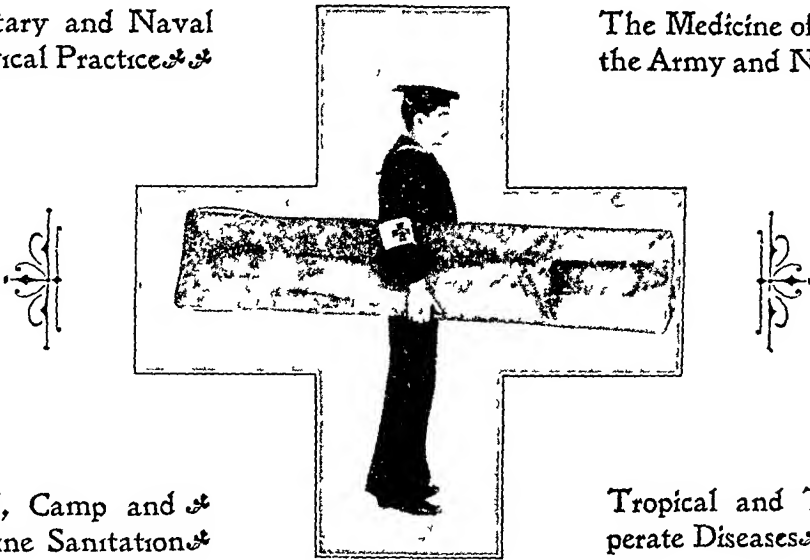
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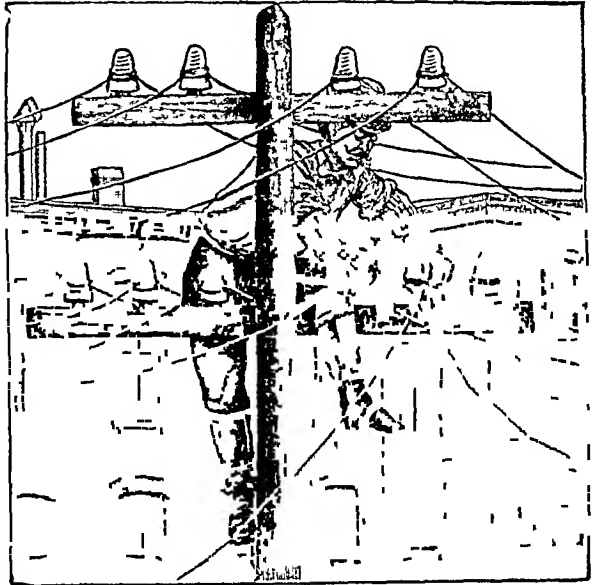
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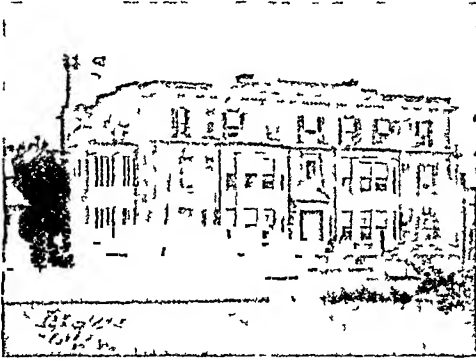
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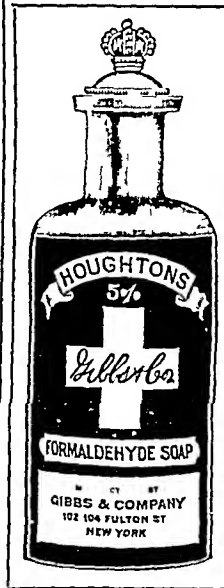
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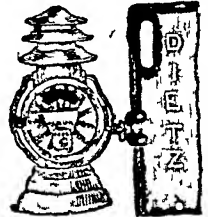
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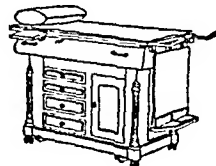
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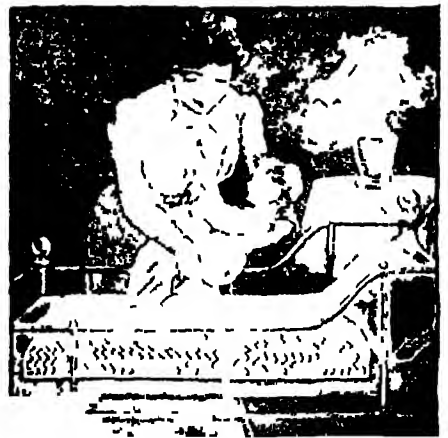
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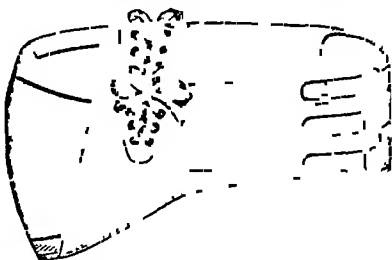
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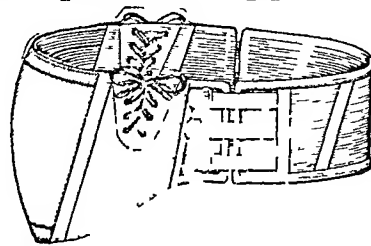
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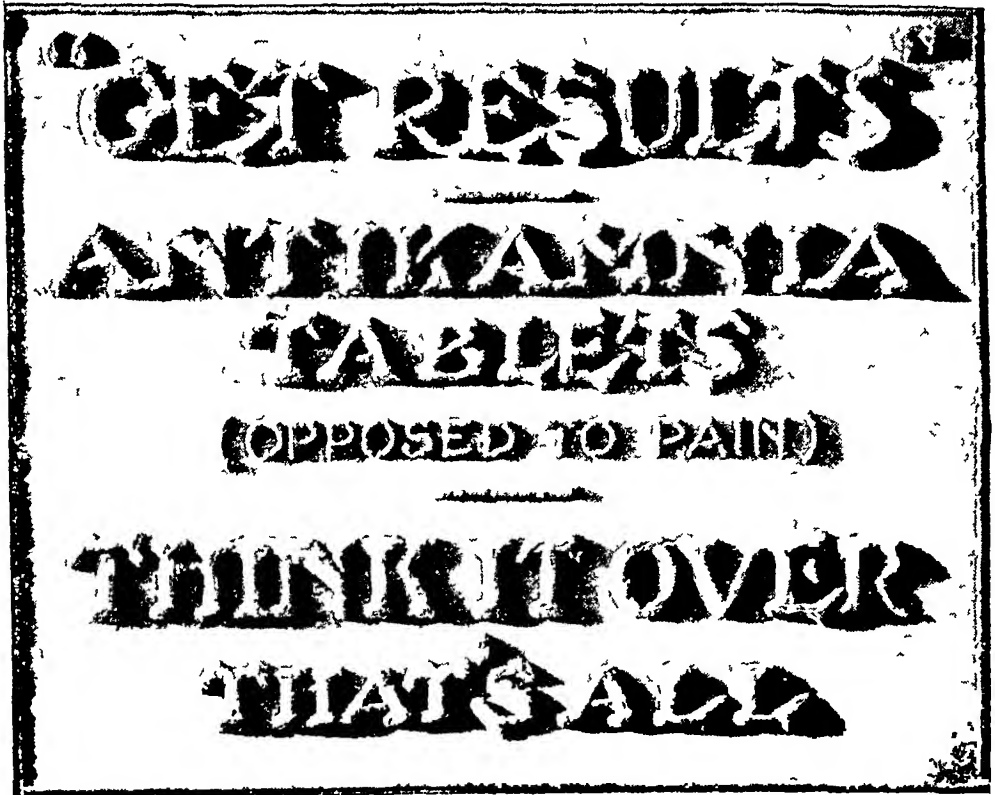
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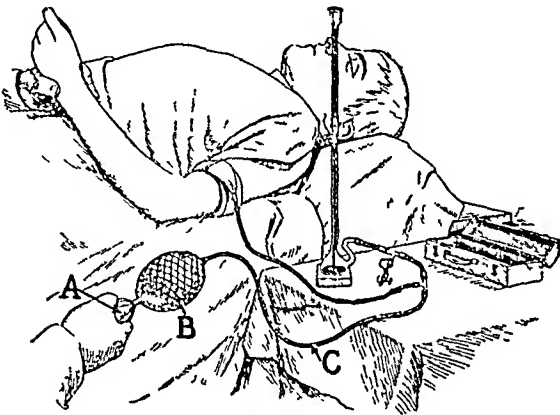
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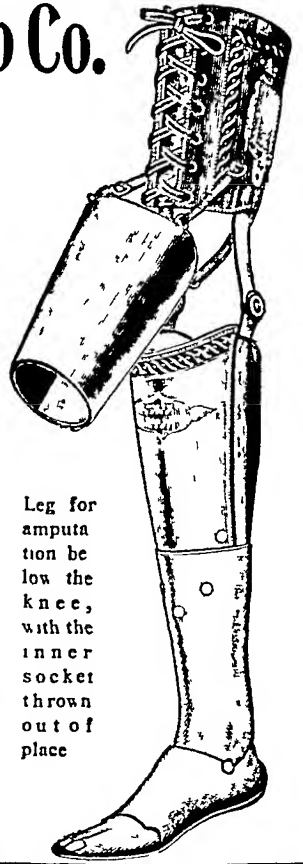
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# ANNALS OF SURGERY

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No 2

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## ORIGINAL MEMOIRS.

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### SURGICAL INTERVENTION IN TUBERCULOSIS OF THE MENINGES AND OF THE BRAIN.<sup>1</sup>

BY ROBERTO ALESSANDRI, M D,

OF ROME,

Professor of Surgical Pathology in the University of Rome, Chief-Surgeon in the Policlinic  
Umberto I

How frequently the meninges and the brain are affected by tuberculous lesions is too well-known to detain us. It is in childhood that the greatest number of cases occur. It is almost always a question of secondary tuberculous localisation, and often the final phase of a glandular, visceral or osseous tuberculosis which at a given moment breaks out in the miliary form.

For our purpose it is important to keep in mind that the greater number of cases also present anatomo-pathologically diffuse lesions, in form of exudations or multiple nodi, such as the eruption of tubercles upon the meninges and along the vessels, and that generally as their seat they prefer the base,—now the base alone, now together with the convexity in greater or less extent,—and sometimes also the spinal meninges, this signifying that in the greater number of cases, the intervention of the surgeon is impossible.

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<sup>1</sup> Read at the International Congress of Tuberculosis in Paris, October, 1905

However, we know also a limited form of tuberculosis of the meninges and of the brain, tuberculous gumma, tuberculous conglomeration. Oftenest it at the same time affects the meninges and the cortex, and sometimes is isolated in the depth of the brain substance. This form of tuberculosis is in its clinical aspect quite different.

All this is well known, it suffices to mention it. What is also well established is that the frequency of occurrence of the two forms is very different. And the proportions change, according as we consider children or adults. I think it is useless to repeat here figures that can easily be obtained from the numerous statistics published.

We have then to distinguish in their anatomic-pathological and clinical aspects, tuberculous meningitis, and the solitary tubercle of the brain.

It is true that between the two forms a distinction in the true sense does not exist, and we can pass from one to the other by numerous intermediary degrees. It is equally true that the two forms are often united, and we find one or several masses of tubercles at the same time with a more or less diffuse lesion of the meninges, a classic meningitis contemporary or consecutive.

In any case the two varieties are very distinct in their typical forms and the possibility and the results of surgical intervention must be considered separately, according as we treat of the one or of the other.

*Of Intervention in tuberculous Meningitis* I have already said that in tuberculous meningitis in general, surgical intervention is considered almost impossible. However, I do not think the following considerations will be without their value.

(a) Tuberculous meningitis does not all present themselves under the form of miliary eruption, they are not all equally diffuse, nor in the same region of the brain.

(b) Although of very rare occurrence a spontaneous healing of the process is nowadays considered possible.

That being so, will Surgery never be able to lend assistance?

(a) As to the first point, numerous researches tend now-

adays to compel our admission that lesions of the meninges are sometimes limited, and present a course that has not the usual forms. I will only mention the well known essay of Chantemesse<sup>1</sup> in which he clearly established the special form of tuberculous meningitis *en plaque*, with quite special anatomical and clinical characters. It consists most frequently of confluent grey granulations, of yellowish pseudo-membranes or fibrous scleroses. The seat may be limited to the convexity of the brain and often to the region of the psychomotor centres.

Chantemesse distinguishes primary and secondary forms. Madeleine<sup>2</sup> justly remarks that we can, at most, speak of meningites which are clinically primitive without being anatomically so in every case.

See also the cases reported by Combe<sup>3</sup> and by Monnier<sup>4</sup>

Trevelyan,<sup>5</sup> in 114 cases of tuberculosis of the nervous system, observed during a course of twenty years at the "Leeds General Infirmary" reports nine of this class in which there were observed thickenings localised over a limited extent of the cortex (Meningitis *en plaque*).

It must be observed that he clearly distinguishes these last cases from those with tuberculous masses (solitary tubercles) in the brain, of which he reports 33 in 114 cases, as we shall see later on.

A similar case calls for consideration, namely, that of Tuffier,<sup>6</sup> who operated a phthisical patient, aged twenty-nine years, suffering also from spasms and paralysis, and affirms that it was not a matter of solitary tubercle, but a plaque of tuberculous meningo-encephalitis. Sænger<sup>7</sup> reports also three cases of tuberculous lesions localized in the meninges, of which one in the left sylvian fissure in a woman of thirty-two years, another in both sylvians, in a man of fifty-eight, the third in the left sylvian in a man of fifty-two. Corresponding with the locality of the lesions there were focal clinical symptoms, in the first case, aphasia and right hemiplegia, in the third case right hemiplegia. It is to be observed that these were adults. We see from this that there exist cases, although rare, of lesions of the meninges of the ordinary type, but limited.

In the statistics given by Weingartner<sup>8</sup> of 245 cases in the anatomo-pathological institute of Kiel there was not one

that exhibited circumscription in the convexity Leitz,<sup>9</sup> on the other hand, reports 3 cases of it in 67 (adults)

In this connection I wish to give four years' statistics from autopsies made at the school of Pathological Anatomy of the University of Rome I owe them to the kindness of Professor Marchiafava, the Director, and his assistants, Doctors Nazari and Ugolini, who have been so good as to furnish me with them

In about 1200 autopsies there have been in all 57 cases of tuberculosis of the meninges and of the brain

*As to Age*—Fourteen cases were children below five, fifteen between five and ten years, eleven between ten and fifteen, nine between fifteen and twenty, and eight above twenty years

In this respect these data do not show much difference from statistics already known

As to the anatomical form it was always meningitis more or less diffuse In one case only (a man of thirty-seven years) there were solitary cortical tubercles in the left hemisphere

Of the 56 cases, in 54 the meningitis had its seat at the base, and in these 54, ten had also reached the vault and oftenest in limited points as follows above the right parietal lobe, at the foot of the first and second frontals, along the parafalcine, once with extensive softening of the left cerebral hemisphere (paracentral circonvolutions and parietal lobe)

Finally twice the tuberculous lesion was limited to the convexity of the brain, more particularly, once especially to the right half, and the other time especially on the paracentrals

I do not intend to dwell on this point, nor to draw conclusions from a small number of cases

I have given the above data, because in a question of such difficulty every contribution is interesting, and because I intend to weigh all the possibilities in order with more confidence absolutely or partially to reject surgical intervention

(b) The healing of tuberculous meningitis is to-day considered possible, and medical literature reports some cases of it With respect to this, Trevelyan justly remarks that we must make a distinction between the ordinary diffuse meningitis and meningitis circumscribed en plaque

It is certain that compared with the enormous quantity of cases followed by death those cured would represent a small proportion however there have been some Even if we consider doubtful those adduced by Politzer,<sup>10</sup> by Rillet,<sup>11</sup> and perhaps even those by Barth,<sup>12</sup> Cadet Gassicourt,<sup>13</sup> and Carrington,<sup>14</sup> in which all the same a healing of the lesion was anatomically demonstrated—that also reported by Dujardin Beaumetz<sup>15</sup> in which tubercles were discovered in the choroid—and those by Cufer,<sup>16</sup> Chappet,<sup>17</sup> and Ward,<sup>18</sup> in which the diagnosis was based upon the presence of tuberculous lesions in other parts of the organism,—still there are other cases that do not admit of doubt Thus the case reported by Freyhan,<sup>19</sup> in which bacilli were discovered at the lumbar puncture, and in which none the less the patient was cured and survived five years in constant good health without further symptoms Jannsen's<sup>20</sup> patient died, three years after, of pulmonary tuberculosis, and the autopsy showed along the longitudinal fissure a soft yellowish mass consisting of round nodi of detritus, and in different parts of the pia mater of grey perivascular nodi Henkel's<sup>21</sup> patient (bacilli in the spinal liquid) was still well after a year Mermann<sup>22</sup> also reports a case of typical tuberculous meningitis, which seemed cured and the subject well for four months, then there was a return of the symptoms and death after ten days, on the examination after death typical tuberculous meningitis was proved

If, as the author believes, this last case proves that there is always a tendency to relapse, or rather to a recrudescence of the process, and that consequently we have only an apparent cure, it loses nothing of its values as evidence

Besides in all surgical tubercloses and especially in osseous and articular tuberculosis, we have cures we call clinical or apparent, which are none the less true cures properly so called and may even become complete in the true anatomopathological sense of the word

Let us consider also the later cases of Rocaz<sup>23</sup> (the diagnosis was based on the seroreaction of Arloing Courmont) reported and anatomically demonstrated by Cruchet,<sup>24</sup> those of K Barth,<sup>25</sup> with discovery of bacilli, of Gross,<sup>26</sup> equally with positive discovery of bacilli resisting acids and of the morphol-

ogical type of Koch, of Thomalla,<sup>26</sup> with tubercles in the choroid, of Sepet,<sup>27</sup> (seroreaction), of Winkler and Gohl,<sup>28</sup> with positive discovery of bacilli, of Mottard,<sup>29</sup> anatomically confirmed

An important case has lately been communicated by Avanzino<sup>30</sup> of the Pammatone hospital at Genoa the diagnosis of tuberculosis was based upon lesions of the optic papilla, on the leucocyte proportion of the liquid obtained from the lumbar puncture, and on the positive result of inoculation in guinea pigs

See also the case I myself have operated and which I report below Sepet<sup>31</sup> supports the opinion of Poncet, that is to say that we can have, fairly often, benign forms of tuberculous meningitis capable of cure and he distinguishes four anatomical varieties of it, among which he includes a light curable form of tuberculous meningitis, whose healing is due to attenuation of the virulence of the bacilli, or to increased resistance of the organism We may add that to this last case probably belong a large number of limited or partial meningitis See also with regard to this, the articles of Mollard and André,<sup>32</sup> of Dor,<sup>33</sup> of Bondet,<sup>34</sup> and Parrenin's<sup>35</sup> essay

Maragliano<sup>30</sup> also admits the possibility of cure in some cases and he believes, that for this purpose, it may be useful to prevent, if one can, the mechanical effects of exudation "Surgery alone," he says, "can answer this necessity in serious cases of richly fibrinous and stratified exudations"

To obtain decompression, besides the lumbar puncture, punctures have been tried of the lateral ventricles, of the fourth ventricle and its reservoir, in the well known case brought forward by Hoid,<sup>37</sup> as there was coma and marked phenomena of compression, in the third week the fourth ventricle was punctured, and the patient recovered But was it really a case of tuberculosis?

I think it would be useless to repeat here the various remarks published relative to similar punctures and decompressive evacuations, and besides it would take too long

I will only mention the following fact Concetti,<sup>39</sup> having ascertained the uselessness of the lumbar puncture from the therapeutic point of view, tried to use it with the object of

introducing directly into the cavity of the meninges certain medicines believed to be effective against the tuberculous process After having drawn away from ten to twenty cubic centimeters of cerebro spinal liquid, without in any way displacing his needle, he injected by means of it into the arachnoid cavity from 5 to 8 cubic centimetres of iodoformed oil of almonds at 1 per cent, or from 5 to 10 grammes of an aqueous iodo iodurate solution (1-10-100) But without result, and he abandoned the practice

I wish to mention also the attempts made by Prof Rotgans,<sup>40</sup> " Experimentally it seems possible to irrigate the base of the brain Injecting a warm solution of colored gelatine at any point of the subdural cavity of the cranium, above the tent of the cerebellum, one finds the gelatine over the whole extent of the arachnoid, as well at the base as at the surface of both hemispheres " Guided by this Professor Rotgans, in two cases of tuberculous meningitis, injected an iodoformed emulsion into the subdural cavity It is true he found in his autopsies, the iodoform at the base, but the children, operated when already in coma, succumbed one or two days after the operation, which was without result

Very interesting also is a case reported by Winkler and Rotgans<sup>41</sup> which I will summarize here

" A little girl of eleven years, with chronic otitis, tuberculous bacilli were proved present in the pus She was trepanned above the postero superior part of the temporal lobe for a left lateral epilepsy, starting from the angle of the mouth Leaving the dura mater intact they drew out from a depth of about one centimetre a considerable quantity of seropurulent liquid, and injected in its place an equal quantity of iodoformed emulsion Some weeks later and two or three times afterwards they repeated the same treatment through the skin at the level of the crown of the trepan At first the result seemed favorable and the Jacksonian attacks ceased, but a year later she was in the psychiatric clinic, mad, with all four limbs contracted and amaurotic through papillary atrophy She died completely mad in November 1899 At the autopsy they found tuberculous meningitis of the base with very acute internal hydrocephalia

Intraventricular injection is therefore possible and even with an immediate amelioration

Of the same kind are the experimental labors of Nan-



notti<sup>12</sup> in the treatment of meningites After having provoked several forms of meningitis in dogs he tried treating them with subdural injections of sublimate And he obtained excellent results in the forms of tuberculous meningitis, while in the forms of acute suppurative meningitis he had none at all He concludes therefore that tuberculous meningitis (at least that which is obtained by experiment in dogs) is susceptible of cure by his method, that the cure may be obtained even if the treatment takes place in the most advanced stages of the disease, that the process of cure of tuberculosis of the meninges has many points of contact with that of peritoneal tuberculosis, studied both by the author himself and by others

After these results, he proposes to apply the treatment of subdural injections of sublimate to man

However, as far as I know, the application has not been yet tried

Taking into account the essential difference of tuberculous lesions obtained experimentally and of the resistance of the dog, these results have still a considerable value

Chipault<sup>13</sup> recalls cases of tuberculosis of the vault of the cranium, complicated by meningo-encephalic lesions, of which the typical form is the perforating tuberculosis with hour-glass collection in two parts, the one extra, the other intracranial and reporting certain cases of it, he mentions having observed some himself The case observed by Guarnieri seems to have resembled this type

Chipault<sup>44</sup> reports also a very interesting case of primitive tuberculosis of the diploë, with perforation of the internal and cortical phenomena, it seems however that lesions of the meninges were wanting It is very seldom we have had more active interventions, and they have always been negative in their results Attempts of this nature have been reported by Romme<sup>45</sup> Chipault quotes a case from Masbrenier<sup>46</sup> in which through erroneous diagnosis, intervention was made above the vault Trevelyan quotes other interventions practised with the same object by Lannelongue and Keen,<sup>47</sup> by Ord and Waterhouse,<sup>48</sup> by Paikin,<sup>49</sup> Paget,<sup>50</sup> Kendal Franks,<sup>51</sup> and others, he reports one equally doubtful of Mayo Robson<sup>52</sup> at the Leeds Infirmary

## TUBERCLES OF THE CEREBRUM OPERATED

|    | OPERATOR                  | YEAR OF PUBLICATION | AGE AND SEX                                                | SEAT AND VOLUME OF TUBERCLE                                                                                         | RESULTS             |                                                                                                                                      |
|----|---------------------------|---------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|    |                           |                     |                                                            |                                                                                                                     | IMMEDIATE           | LATER                                                                                                                                |
| 1  | MacEwen (?)               | 1885                | Male, 36 years<br>(Duret erroneously notes female 7 years) | Plaques of meningitis and encephalitis circumscribed (tuberculous?) on the ascending frontal (a small nut)          | Cure                | Continued 8 months later                                                                                                             |
| 2  | Horsley                   | 1887                | Male, 22                                                   | Tubercle of the third middle inferior of the ascending convolutions (ball of the thumb) 2 mm                        | Cure                | Six years after, vertebral tuberculosis 18 months after, epydymitis and tuberculous nephritis Dead                                   |
| 3  | MacEwen                   | 1888                | Female, 7                                                  | Subcortical tubercle in the upper part of the ascending convolutions (little nut)                                   | Cure                |                                                                                                                                      |
| 4  | Knapp and Bradford        | 1889                | (Duret—Male, 37)<br>Male, 32                               | Subcortical tubercle in the posterior portion, middle third of the Rolandic region (weight, 35¾ grams)              | Death after ¾ hr    |                                                                                                                                      |
| 5  | Mercanton and Combe       | 1889                | Female 12                                                  | Solitary tubercle in the middle part of the ascending frontal convolution                                           | Cure                | Death 4 or 5 months after the operation<br>At the autopsy, 4 tubercles were found at different points of the cerebrum and cerebellum |
| 6  | Booth and Curtis          | 1893                | Male, 35                                                   | Hour glass tubercle in the frontal region (weight, 20-25 grams)                                                     | Cure                | Death within two months from relapse Multiple                                                                                        |
| 7  | Winkler and Guldenarm (?) | 1893                | Male, 19                                                   | Calcified tumor on the anterior central (healed tumor?) 2½ cm — 1½ cm Weight, 12 grams                              | Cure                | Sudden death 2½ years after                                                                                                          |
| 8  | Czerny                    | 1894                | Male, 23                                                   | Tubercle of frontal region As large as a fist (weight, 205 grams)                                                   | Cure                | Re-operated for tuberculous meningitis, and died 4 years after                                                                       |
| 9  | Schwartz                  | 1894                | Male, 33                                                   | Tubercle of Rolandic region (centre of superior member) As large as a nut 6 x 2 cm                                  | Cure                | Death from tuberculous meningo encephalitis 1½ months later                                                                          |
| 10 | Kronlein                  | 1895                | Male, 43                                                   | Tuberculome in the inferior part of Rolandic region As large as a hen's egg                                         | Cure                | Still living and in fairly good health in 1901                                                                                       |
| 11 | Tassi                     | 1895                | Female                                                     | Tubercle in the frontal region (hazel nut)                                                                          | Cure                | Death some months after                                                                                                              |
| 12 | Broca                     | 1896                | Male, 35                                                   | Tubercle in the middle third of the ascending frontal and foot of the second frontal partial removal with the spoon | Amelioration        |                                                                                                                                      |
| 13 | De Poli                   | 1897                | Female, 18                                                 | Tuberculome of the right motor zone                                                                                 | Nil                 | Death at the end of 5 months                                                                                                         |
| 14 | Sick                      | 1897                | Female, 24                                                 | Solitary tubercle like a hazel nut, behind the central posterior convolutions                                       | Cure                |                                                                                                                                      |
| 15 | Schmizler                 | 1898                |                                                            | Tuberculome of the right precentral circonvolution                                                                  | Died after 26 hours |                                                                                                                                      |

## TUBERCLES OF THE CEREBRUM OPERATED—(Continued)

|    | OPERATORS               | YEAR OF PUBLICATION | AGE AND SEX | SEAT AND VOLUME OF TUBERCLE                                                                                                          | RESULTS   |                                                                                                                                                                                                                          |
|----|-------------------------|---------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                         |                     |             |                                                                                                                                      | IMMEDIATE | LATER                                                                                                                                                                                                                    |
| 16 | Heidenhain <sup>1</sup> | 1889                | Male, 29    | Solitary tubercle, subcortical, of the paracentral lobule (size of a small hazel nut)                                                | Cure      | Continuing 2 3 years after                                                                                                                                                                                               |
| 17 | Roux                    | 1900                | Female, 7½  | Tuberculum of the Rolandic region (size of a mandarin orange) 4.5 × 5 cm                                                             | Cure      | Continuing 2 3 years, 10 months after                                                                                                                                                                                    |
| 18 | Roux                    | 1900                | Male, 38    | Tuberculum of the Rolandic region—ascending parietal (size, pigeon's egg)                                                            | Cure      | Lasting 5 months after                                                                                                                                                                                                   |
| 19 | Lunz                    | 1903                | Female, 22  | Tubercle of the Rolandic region (size of a nut)                                                                                      | Cure      | Death at the end of three months. At the autopsy, multiple tubercles found in the right parietal and occipital lobes, in the sinus of the cillous bodies and in the great falk of the cerebrum tuberculous leptomeninges |
| 20 | Durante                 | 1903                | Male, 23    | Tubercle of the third superior of the ascending parietal and of the anterior portion of the upper and lower parietal circonvolutions | Cure      |                                                                                                                                                                                                                          |
| 21 | Tuffier                 | 1903                | Male, 29    | Plaque of tubercular méningo encephalitis in the left Rolandic region                                                                | Cure      | Continuing (July, 1905)                                                                                                                                                                                                  |
| 22 | Alessandri              | 1904                | Male, 31    | Tuberculum of the Rolandic region—third superior (size of a small nut) 5 × 2½ cm                                                     | Cure      |                                                                                                                                                                                                                          |

## TUBERCLES OF THE CEREBELLUM OPERATED

|   | OPERATORS          | YEAR OF PUBLICATION | AGE AND SEX | SEAT AND VOLUME OF TUBERCLE                                                          | RESULTS   |                                            |
|---|--------------------|---------------------|-------------|--------------------------------------------------------------------------------------|-----------|--------------------------------------------|
|   |                    |                     |             |                                                                                      | IMMEDIATE | LATER                                      |
| 1 | Bennet             | 1887                | Male, 7     | Tubercle of the right hemisphere (pigeon's egg)                                      | Death     | From shock after 4 hours                   |
| 2 | Horsley            | 1887                | Male, 18    | Tubercle of right hemisphere (weight, 7 grms)                                        | Death     | 19 hours after                             |
| 3 | MacEwen            | 1893                | Male        | Two tubercles of the cerebellum (one the size of a nut, the other smaller)           | Cure      | Died 10 months after, through relapse      |
| 4 | Parry              | 1893                | Male, 5½    | Tuberculum in left hemisphere Incomplete removal with spoon                          | Death     | From hemorrhage or shock, some hours after |
| 5 | Lampasi            | 1895                | Male, 45    | Tubercle of the left hemisphere (size of a chestnut)                                 | Death     | Of shock at the end of 15 hours            |
| 6 | Collins and Brewer | 1897                | Male, 26    | Tuberculum of right hemisphere (diameter about 2 cm) Removal in 3 fragments by spoon | Cure      | Died 2½ months after                       |

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In Italy I only find five cases of interventions in tuberculous meningitis registered. They are those of Raffa,<sup>53</sup> of Guarneri,<sup>54</sup> of Codrilla<sup>55</sup> and two of Caselli<sup>56</sup>. In these two last there was a mere supposition of tuberculous meningitis, but on operating nothing was found. Those of Raffa and Guarneri are published in the report read by Roncali before the Twelfth Congress of the Italian Society of Surgery (1897), the others are reported in the collection of Chipault. In the case of Caselli the operation did not confirm the diagnosis, the case of Guarneri may be classed with those of cranial lesions with diffusion to the contents. The result was negative in all these cases.

I have myself<sup>57</sup> lately operated a child whose lesions led me to believe there had been a tuberculous meningitis, limited and healed.

The child was an orphan of eleven years. All hereditary syphilis was excluded, the mother died of chest complaint. There is a sister affected with ordinary epilepsy.

He had always been well until three years ago, when he began to suffer from convulsive attacks of clonicotonic type, these attacks begin in the muscles of the left hand, spread then through the whole arm, the face and the leg on the same side. It is impossible to give precise data as to the beginning of the affection, it commenced, it seems with fever and general cerebral symptoms, it is certain that all at once the attacks became more frequent, and after some time again more rare. While he was at the hospital they were repeated at irregular intervals of a few days, of a month, and even more, generally two or more attacks in the same day, the duration was always of a few minutes, without loss of consciousness, no emission of fecal matters, nor of urine, the patient did not foam, nor bite his tongue. The attack always commenced in the upper left member, spread sometimes to the face, at others to the leg, but always on the left side. It is to be noted that the attacks are generally preceded and followed by an increase of temperature (even to 38° degrees) which ceases by lysis. The objective examination presents nothing abnormal, only the muscular force of the right arm gives 25, that of the left 14. Otherwise, nothing as to mobility nor sensibility nor of the organs of the specific senses.

Operated by craniectomy, on the middle part of the right rolandic zone we found the dura mater thickened and resisting irregularly for an extension of about four by five centimetres, adhesions partly light, partly fibrous, to the soft meninges and cortical substance, especially visible along the vessels, and echeloned in nodular form in the two paracentral circonvolutions (middle part) We detached the adhesions, putting iodoform gauze in the wound on account of the fairly considerable hemorrhage, with partial suture of the dura mater, and replacing of the flap

Healing per primam with quite normal course On the eleventh day, a very slight attack, lasting a minute and limited to the arm and left side of face After that, condition normal

Although there is no diagnostic certainty, the age, the anamnesis, the lesions found on operating and above all the disposition of the adhesions along the vessels make me think that probably they were the results of tuberculous meningitis spontaneously cured

In conclusion of what concerns the first part of my report, we must agree that, in the greater number of tuberculous processes of the meninges, above all in cases that run their course with the usual forms, surgical intervention is not to be advised, and the few cases in which it has been tried have not had success

The different operations with decompressive scope have for the most part only a temporary value The simple lumbar puncture has been up to now the operation preferred, on account also of its high diagnostic value In some rare forms of meningitis in plaques, of meningitis of chronic course with localisations prevalent upon the meningian vault, or in the consequences of a localised and healed tuberculosis of the meninges we can speak of active surgical intervention Those cases, besides, may, up to a certain point be classed among the lesions I am going to describe in the second part of my report

Although we cannot repose with too much confidence upon the results of intervention in such cases, we must not either reject it a priori, the progress obtained in the domain of surgery exists to prove to us that, very often, successes have been obtained which theoretically seemed impossible

*Of Surgical intervention in the solitary tubercle of the brain*—When the tuberculous lesion does not take the ordinary form of a more or less diffuse meningo-encephalitis, we have what is called “solitary tubercle” whose form is generally almost spheroidal. This lesion is almost called Tuberculous Gumma, or tuberculous conglomerate, and its clinical physiognomy causes it to be classed among cerebral tumors.

Generally this type of tuberculous lesion does not affect the dura-meninge, on the contrary it attacks the pia mater at the same time as the cerebral substance in which it is embedded. It is not rare either to find it quite subcortical, without any relation with the meninges from which it is entirely removed (oval centie).

From statistics the frequency with which we find solitary tubercles in the brain is very great, above all in children. But, age apart, two other conditions are of the highest importance for the subject in hand: the part of the brain which is the seat of the tubercle and the unity or multiplicity of this last. With regard to frequency in general the statistics furnished by Allen Starr,<sup>58</sup> quoted in all treatises, gives out of 600 cases of cerebral tumors examined on the anatomical table, 193 solitary tubercle while the sarcomæ and gliomæ, though they are the neoplasms of most frequent occurrence are respectively only 120 and 91. The statistics of Birsch Hirschfeld<sup>59</sup> give 132 tubercles in 342 tumors, those of Hale White<sup>60</sup> 45 in 100. Durante<sup>61</sup> combining the statistical data of Starr, Seydel, Bernhardt, White and Birsch-Hirschfeld, in a total of 1633 cases of endocranial tumors, gives 489 tuberculosis to 414 sarcomata, 253 gliomata, and a smaller number of other less frequent varieties.

With regard to age, in 125 cases of tuberculosis in children, Simmonds<sup>62</sup> gives 16 solitary tubercles (12.8 per cent), Schweig<sup>63</sup> 21 in 96 (21.9 per cent), Boltz<sup>64</sup> 18 in 161 (11.2 per cent), altogether 55 solitary tubercles in 382 cases of tuberculosis (14.4 per cent and 2.1 per cent for all autopsies). Hamann<sup>65</sup> at the Anatomico Pathological Institute of Kiel, found, in five years, among adults, 15 cases of solitary tubercles, equivalent to only 4.3 per cent of the cases of tuberculosis. Plambeck,<sup>66</sup> in ten years, found still less, 9 cases

(18 per cent), altogether among adults, in fifteen years, the cases of solitary tubercles represent only 31 per cent of the cases of tuberculosis, and 07 per cent of the total autopsies

So, among children, the frequency would be about four times greater than among adults. According to Starr, of 193 cases collected by him 152 referred to individuals below twenty years and 41 cases only to adults.

The report as to other tumors also has its importance. While among individuals below twenty years we have 37 gliomata and 34 sarcomata, above twenty years in comparison with only 41 tubercles, we have 54 gliomata, 86 sarcomata and 25 gliosarcomata. With regard to tuberculosis of the meninges, in 161 cases Boltz found it 64 times against 18 cases of solitary tubercle, Schwer observed 83 meningites and 21 solitary tubercles. In the 490 cases of Plambeck, 62 times, that is to say in 12.6 per cent there was tuberculosis of the meninges, while the solitary tubercle only represented 18 per cent. Hamann, in 346 cases, found 15 solitary tubercles (4.3 per cent) and 37 tuberculous meningites (10.7 per cent).

But a still more important fact is that the tuberculous meningitis coexists often with the tubercle. In Boltz's 18 cases, 15 showed also tuberculous meningitis. Nothnagel<sup>67</sup> also remarks that the association of a solitary tubercle and of a tuberculous meningitis is a very frequent fact. In 16 cases of solitary tubercles, Simmonds found tuberculous meningitis in association with it ten times. In Eulenberg's<sup>68</sup> statistics, in 148 cases, 38 times there was coexistence of meningitis. Trevelyan<sup>69</sup> reports 33 cases of solitary tubercle in 114, and of these 33 there were 23 with meningitis.

In consequence, we may say, that, especially in children, in about 73 per cent of the cases the solitary tubercle is associated with the tuberculous meningitis that is to say three or four times oftener than it is found isolated.

With respect to the regions of the brain attacked, Allen Starr's statistics give the greatest frequency in the cerebral axis (70), above all in the pons, in the ganglia of the base, in the quadrigeminal tubercles and in the peduncles, after that in the cerebellum (55) while in the cerebral cortex and in the

oval centre they give only 22 and 8 respectively. The figures in Eulenberg's Encyclopedia give 66 cases in the cerebral axis (especially in the pons, in corpora striata, and the optic layers) 55 in the cerebellum, and 51 in the cortex. A second set of statistics gives in 108 cases of solitary tubercle, 36 in the cerebellum, 34 in the cerebral axis and 7 in the cortex. Nothnagel and Gerhardt<sup>70</sup> also give the cerebellum as the seat preferred, in Trevelyan's cases the order of frequency is the cerebellum, the pons, the peduncles, and then the cortex. Another very important fact for us is the frequency with which, despite its name, the solitary tubercle is multiple. In Allen Starr's statistics which we have already quoted many times, multiple tuberculomes are noted 34 times in 152 cases under twenty years, and 4 times (in 41 cases) in adults. In Eulenberg's statistics in 148 cases, 67 are really solitary tubercles, while 81 cases were multiple. In the 33 cases reported by Trevelyan 17 were multiple. In general we find 2, 3, sometimes 4, but there are other cases in which we meet with many more. Homen,<sup>71</sup> West,<sup>72</sup> Hensch<sup>73</sup> mention 12, Middleton<sup>74</sup> found as many as 24, whose size varied from that of a pea to that of a hazel nut, and which were scattered in the grey substance of the frontal, parietal and occipital lobes and in the cerebellum, and it is to be noted that there were no symptoms during life.

From all that precedes certain points have been determined, which are of capital importance for the subject of surgical intervention.

The most frequent occurrence is in children, compared with other varieties it is the tubercle that is in their case the commonest cerebral tumor. It is also in the child that we most frequently meet the multiple tubercle, very frequently accompanied by more or less diffuse meningitis.

In adults, on the contrary, it is relatively rarer and, besides, very often single and without complications.

Further in children, as in adults, the seat of the tubercles, simple or not, is often in difficultly accessible regions of the brain.

Apart from what precedes we have to consider also the two other following facts.



(a) The coexistence in the organism of other tuberculous lesions whose presence counterindicates any intervention

(b) The possibility of a spontaneous healing without surgical aid

(a) As to the first point it is well known that the ordinary tuberculoses of the meninges are nearly always secondary to other foci in the organism. We find oftenest tuberculous lesions, whether old or recent, in the glands, above all the peribronchial and mesenteric, in the lungs, sometimes in other viscera, in the bones, the joints, etc.

One may also have a diffusion of the tuberculous process through continuity (caries of the bones of the cranium, lesions of the nasopharynx, of the middle ear, etc.) According to Heller,<sup>75</sup> one can never have, especially in children, a direct infection through the lymphatic vessels by the nasal cavities (primitive cases?). In 44 observations on solitary tubercles, Hale White reports that there have always been other localisations of tuberculosis in the organism, only in 5 cases, was a single organ attacked and in 4 two were attacked, in the other cases, 3, 4, 5 organs or apparatuses were affected, and even more sometimes. In Tievely's 114 cases, only six showed no other foci, but the autopsies were incomplete.

Evidently in the case of generalised tuberculosis or of very diffuse and advanced tuberculous lesion—even of a single apparatus (respiratory, digestive, etc), it is vain to think of surgical intervention for the cerebral lesion, which, in such cases, passes into the second line. Of the 9 cases, out of Hale White's 45, cited above, that had limited foci in the other parts of the organism 1 case had multiple tubercle, in another the seat of the tuberculome was the pons. Of the other 7, one was accompanied by meningitis of the base, 3 were very diffuse.

We must recognize that these statistics are very discouraging.

(b) The possibility of healing of solitary tubercles is nowadays strengthened by many observations, and many researches have been made as to the manner in which this healing is effected.

The tuberculous conglomerate, really a mass of miliary

tubercles, can, on developing, attain a size varying generally between that of a green pea and that of a pigeon's egg. Some even larger have been reported. Jackson says he found one as large as a billiard ball in the cerebellum of a child of five years, Arnot found four as large as a hen's egg in the cerebrum of a child of four years and a half, Nothnagel, as large as a duck's egg, Trevelyan as large as an orange and even larger. The one Czerny extirpated weighed 205 grammes, that of Knapp and Bradford 63, that of Kronlein was as large as a fowl's egg, those of Roux and Terrier as large as mandarin oranges. Duante mentions two in the same individual, of which one weighed 30 grammes, the other 40, the one I extirpated myself was as large as a little nut.

The cheesy degeneration, above all in the centre, is ordinarily very early and its limitation by cerebral substance is also more or less definite, we often find all round a certain extension of hyperæmia and vascular development or a zone of tissue of granulations which can be sometimes transformed into a real capsule of compact fibrous tissue. In this case it is evident there is a tendency to incapsulation and sometimes to calcification which leads to a cure.

Treyer<sup>76</sup> reminds us that Wernicke, Gowers, Knapp, Starr, Baginsky, Steinberg, Sahli and others report cures of this class, and the greater part took place after treatment with strong doses of potassium iodide. Bruns equally affirms, that Gowers obtained cures with potassium iodide, codliver oil, iron, country air, etc.

Certainly, in such cases cure is notwithstanding always relative, and we must before all things exclude a syphilitic lesion.

In two cases he reports, Trevelyan found a fibrous centre and a calcareous mass that one might consider as healed tubercles. In one case Williamson<sup>77</sup> met with a little yellowish mass, in another, Ashby<sup>78</sup> found a little cyst with earthy walls, Bristowe,<sup>79</sup> in a third case, a hard mass in the cerebellum. In all three cases there was death from tuberculosis and afterwards other tuberculous masses were found in the brain. In a case reported by Kahlmeyer<sup>80</sup> there was a scar with yellowish striæ in the cerebellum of a woman who eleven

years before, had presented phenomena of disease of cerebellum, the woman was consumptive, there was no syphilis Oppenheim<sup>81</sup> reports the case of Siemon, in which the autopsy discovered in the brain an old tubercle, at first caseified, and afterwards ossified When alive, the individual was hemiplegic and an idiot Winkler<sup>82</sup> presents a case operated by Guldenarm, in which he found in the central circonvolutions, where he extirpated it, a calcified tumor of strange form, like a segment of a sphere whose chord would be  $3\frac{1}{2}$  centimetres Its weight was twelve grammes and a membrane prolonging itself across the cortex put it in communication with the pia mater After having decalcified it they found it enveloped by two membranes one thick and of connective tissue, the other of granulation tissue These two membranes covered a centre formed of calcified detritus The case mentioned by Foa<sup>83</sup> is also very important He found in the cerebellum a nodus of fibrous, almost tendinous aspect, with irregular edges, in the centre two little yellowish foci, thick, of cheesy appearance there were also lesions of the dura mater and of the soft meninges, demonstrating an old meningitis cured

From what precedes we can then consider some cases as certain, others on the contrary are very doubtful and we can hardly speak of true cure, without considering that for the brain and especially for certain regions of this last, as we shall see further on, the tubercles even if they become incapsulated or are calcified always represent a lesion with grave functional symptoms The mode of healing is rather a question of pathological histology, and although interesting, to be shorter, I shall speak of it in passing I will mention, however, the interesting experimental researches of Barbacci<sup>64</sup> He, in the struggle against bacilli, attaches the greatest importance to the fixed elements but especially to the mobile elements, first the polynucleated, then the mononucleated and to the calcification of the focus Let me notice also the observations of Roncali<sup>65</sup> on the case operated upon by Durante These observations support the possibility of a connective fibrous transformation This commences, it seems, in the central part of the nodus, particularly under the action of the elements of immigration around tubercles which are evidently in course of involution

In one case which I myself operated, I remarked rather a tendency to capsulation of the process by development of a connective fibrillous tissue at the periphery of the tumor, this tissue was, at certain points of adult fibrous type, this connective neoformation was not uniformly developed at all points, in the inferior section of the tuberculome, it was not clearly limited by the cerebral substance, one even saw histologically the gradual passage of the typical tuberculous granulation into the nervous tissue, accompanied by abundant parvicellular infiltration

The results I have attempted to put together up to now lead us to the following conclusion there can be a question of surgical intervention in only a small number of cases even when it is a matter of limited tuberculous lesions of the brain

And this by reason of, specially, the ordinary site of the tubercles, the frequent complication with meningitis, their multiplicity, the presence of other serious tuberculous lesions in other organs of the body

Relative to intervention the possibility of spontaneous healing has an importance which varies according to the point of view under which we consider it In effect, if in some inaccessible regions and in case of multiplicity of tubercles, the possibility of healing has to be thought of for medical treatment, surgical intervention can not be excluded for the regions where it is possible, since a tuberculous conglomerate may occasion very serious functional derangements even if this conglomerate is capsulated and stationary More, it may encourage to surgical action even in the possible hypothesis of other similar cerebral foci, in other silent seats

In any case to allow of intervention the essential point is that we can diagnose with precision the seat of the lesion, and it goes without saying that this must be surgically accessible

What precedes concerns as much the tubercle as any other cerebral tumor, and the question being well known and very common it need not delay us in our special report Several authors have related cases of tubercles of the pons, of the quadrigeminal corpora, of the cerebral peduncles, in which symptomatology allowed the seat of the lesion to be deter-

mined, but in which there was evidently no possibility of surgical action

It is evident that in this connection possibility of establishing exactly the seat of the lesion will present itself first to the Rolandic region, secondly and in a few cases for the tubercles of the cerebellum, for the frontal lobes, sometimes for the occipital and sphenotemporal (visual and auditory centres) It is often even much more difficult to determine if the lesion is meningeal, cortical or deep seated For the psychomotor centres themselves the presence or the absence of epileptiform attacks accompanied, or not, by persistent pareses and their clonic or tonic character are not sufficient to allow us to diagnose the seat of the process in the meninges or in the cortex So also in the case of cephalalgia and local heat mentioned by some Cranial percussion both in its timbre and in the pain it causes is without gainsaying very important, MacEwen and Bruns insist on this De Paoli<sup>87</sup> has made important researches with regard to this subject Durante has proved its value in many cases, but it is not always certain In my case, for example, the percussion and the pain led to the probable diagnosis of a lesion of the meninges while the dura mater was perfectly normal, not adherent, and the cortical focus rather deep

When we have established the seat of an organic lesion and this seat is accessible with regard to our subject we could here put two questions

1 —Is it possible also to diagnose the nature?

2 —And if we diagnose tuberculous tumor would that dissuade us from intervention?

In general diagnosis of nature is always very difficult

In the particular case of tuberculosis, apart from the age, the hereditary antecedents, and the general constitution of the subject (data always uncertain) an important argument is from the presence of other tuberculous foci in the organism most often in the lungs, in the lymphatic ganglia, in the bones or articulations

Several consider the examination of the ocular cavity (tubercles in the choroid) as decisive now since the positive discovery has for its special characteristic a meningitic dif-

fusion, it is evident on this account that this discovery cannot have place in the typical cases of solitary tubercle, which are just the cases susceptible of surgical operation and one cannot have the discovery of a simple papilla of stasis (especially in circumscribed lesions) or, if it exists, it indicates nothing except an endocranial compression, whose nature it does not inform us of

Increases of temperature at sunset, above all if coincident with the attacks, may on the contrary give us a probability. It goes without saying that we should not be able to attribute them to other causes or to other foci existing in the organism.

The same thing may be said of the injection of tuberculin, it may indeed indicate to us tuberculosis in the organism, but the lesion may exist in other organs. See the communication of Dupont<sup>88</sup> to the International Congress of 1900.

The diagnosis of the nature cannot be made then, or it will be rested upon probability in a few cases.

That, however, does not exclude intervention. And before everything for the good reason that even if it were demonstrated that in presence of tubercles it is better not to intervene, the uncertainty of the diagnosis should not stop us in other processes in which, given the clear symptom, intervention may be useful.

In the second place because while taking into account all the difficulties and the data mentioned above, the majority admit to-day that the tubercle is susceptible of extirpation and of cure. And statistics confirm this.

Bergmann<sup>89</sup> himself who is considered opposed to intervention, says merely that he does not wish to enter into the question of operation or non-intervention in the case of tubercles, especially of those of the cerebellum, but adds when the operation shows there is a tuberculous tumor it must always be removed. Now as it is generally so (the diagnosis of nature being only possible approximatively), we can say we are all agreed upon the practical indication of intervention in cerebral tubercles, provided it is indicated by the following conditions: precise diagnosis of the seat, accessible region, absence of signs of multiple or diffuse lesions, general satisfactory condition of the subject.

It is not my part here to enter into technical details which do not differ from those in the case of cerebral tumors generally

Oftenest, the tuberculome can be removed easily thanks to the sufficiently exact limitation one finds in the greatest number of cases we have often succeeded in extirpating them with a blunt instrument, or with the finger, seldom with the sharp knife or the spoon

I will rather report the statistic data important for our purpose, since they teach us what has been done up to date, as well as the results obtained, they may also encourage us to greater boldness and to better hopes

In the statistics I only include cases in which the tubercle was found on operation and removed

The first sets of statistics of Chipault<sup>90</sup> and Bergmann<sup>91</sup> report respectively 9 cases, the first, and 8, the second, for the cerebrum and 3 and 4 for the cerebellum

Auvray<sup>92</sup> adds another case

Treyer<sup>93</sup> when repeating them summarized the cases already published and added two new ones from Roux

So, altogether, deducting the operations unsuccessful or palliative, he has put together 16 cases of operations upon solitary tubercles in the brain (12 in the cerebrum and 4 in the cerebellum)

In one case however (obs x1 of Macewen) it is very doubtful if it was tuberculosis. He reports, besides, 10 cases where the intervention was ineffectual whilst the autopsy showed one or even several tubercles whose position varied. Amongst these last, one of the cerebellum (Parry's case) must be included in the first series because the tubercle was partially removed

There were then 12 cases operated for the cerebrum, and 5 for the cerebellum. Kronlein<sup>94</sup> at the Thirtieth Congress of the German Surgical Society (April 1901) reporting on the man operated by him in 1895 who was still living, repeated Treyer's statistics

Duret<sup>95</sup> reports 16 cases of the brain but, amongst them, he includes the case of Andrenoud, in which nothing was found at the operation

Of the other 15, 12 were already reported in the preceding statistics, the three new ones are the cases of Bayerthal, of Lunz and Heidenham. But Bayerthal's case and Heidenham's are the same, the case was operated by Heidenham and published by Bayerthal, his assistant, afterwards Heidenham himself communicated it to the German Congress of Surgery.

There are then really 14 cases.

On the other hand, he omits the two cases reported by Sick<sup>96</sup> and Schnitzler,<sup>97</sup> which make 16 cases.

For the cerebellum he reports 7, of which 3 are already included in Treyer's statistics, and that of Parry, reported by Treyer erroneously among the unfruitful operations, but we must subtract Terrier's case, reported even by Treyer, and the other two of Jaboulay and Descot, and of Okynzic-Tuffier, in which the tuberculous tumor was not found in the operation. On the contrary I think the case of Tuffier I reported in the first part of the report can be included in the statistics.

To resume there have been 17 cases of the cerebrum and 4 of the cerebellum. To these we must add the case of Collins and Brewer, reported by Treyer.

Further we may report the Italian statistics. In Italy 6 interventions for tubercles of the cerebrum and 3 for the cerebellum have been published. The cerebral interventions are those of Tassi,<sup>98</sup> Poli,<sup>99</sup> De Paoli,<sup>100</sup> Bendandi,<sup>101</sup> Durante<sup>102</sup> and Alessandri,<sup>103</sup> those of the cerebellum are those of Lampiasi<sup>104-105</sup> and Nota<sup>106</sup>.

I résumé here the results.—In operating, the tuberculous lesion was not found either in the case of Poli (it was in the left cerebral peduncle), nor in the case of Bendandi, (two tubercles at the external and posterior part of the third temporal of both sides). Amongst the cerebellous tubercles, the first case of Lampiasi is that which Treyer and others report very inaccurately, the tumor was not discovered at the operation. In the second case, on the contrary, the tumor was found and extirpated. In Nota's case the operation was also unfruitful.

We must then only add to the statistics above given 4 cases of cerebral tuberculosis and 1 of tuberculosis of the cerebellum. In all, 22 cases of operation for the cerebrum and 6



for the cerebellum In his last collection Chipault <sup>107</sup> mentions two other cases in which he only made some quite simple decompressive trepannings without finding the tumor which was discovered at the autopsy, in one of the cases they found a tubercle in each of the hemispheres of the cerebellum, and in the other they discovered a large plaque of cheesy meningitis in the right frontal region It is also necessary to mention in passing, without including it in our statistics, the case of Fison and Luckham,<sup>108</sup> that is to say of a young man of 16, in which death took place before the end of the trepanning, at the autopsy a tubercle was found in the left lobe of the cerebellum

I think on the contrary that it is necessary to add to the statistics the case of Winkler and Guldenarm mentioned above

So that the cases operated, in which on operation the tuberculous lesion was discovered and removed either entirely or partially are 21 for the cerebrum and 6 for the cerebellum

See in the tables (pp 169 and 170) their most important details

In conclusion, given the limitations to indication for operating I have spoken of above, the results are fairly good for the cerebrum In 22 cases operated the result of the operation was favorable in 19, it is true we must add that, in some of these cases, the amelioration was very little or none at all In several cases treated by surgical intervention, there was death following more or less closely, whether through multiple tubercules or through meningitic diffusion of the process But in others the good result continued long enough and has probably lasted We have in fact reports of the good health of the patients operated by Macewen (after eight months), by Horsley (after six years), by Czerny (during four years), by Kronlein (after six years), by Roux (after about three years, and after five months), by Alessandri (now after more than a year)

The statistics of tuberculoses of the cerebellum are, on the contrary, more discouraging in fact, in 6 cases in which we have been able to find a lesion and to remove it by means of the operation, 4 cases were immediately followed by death and two others had only a transitory amelioration since death took place after two months and a half in the one case and after

ten months in the most favorable case (Macewen) What precedes seems then to justify the idea of Beigmann who advises against intervention in cases of tuberculosis of the cerebellum

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## BIBLIOGRAPHY OF CASES OPERATED UPON IN WHICH TUBERCULOUS TUMOR WAS FOUND AND REMOVED

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### A BRAIN

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# THE ELASTIC LIGATURE AND THE LIGATURE METHOD<sup>1</sup>

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HISTORICAL AND EXPERIMENTAL DATA FROM THE SURGICAL  
LABORATORY OF THE MEDICAL DEPARTMENT OF THE  
UNIVERSITY OF CALIFORNIA

BY DUDLEY TAIT,  
OF SAN FRANCISCO, CAL.

THE paucity of accurate data concerning the history of the elastic ligature has prompted the present communication, in which the topic is also viewed from the standpoint of experimentation. No claim to originality is made, in view of the conceded threadbare condition of the subject to which the experiments relate gastric and intestinal suture. To an Italian surgeon, Grandesso Silvestri, of Vicence, we owe the first published reference to and experimental study of the elastic ligature (1862). A year later, Richard, acting upon Prof. Trousseau's advice, used the elastic ligature in various cases, 17 in all (vascular growths, tumors of the breast, fistulæ in ano, etc.), and reported the results in a brief memoir (1863). Subsequently (1865) two English surgeons, Bryant and Henry Lee, resorted to this method for the removal of lipomata, hemorrhoids and pediculated growths, and in 1871 Henry Lee reported to the London Clinical Society an ablation of the tongue by means of the elastic ligature.

The same year Grandesso Silvestri published a second memoir on the subject, confirming and completing his original conclusions.

The above mentioned trials passed almost unnoticed. Hence Dittel's announcement of the discovery of the elastic ligature before the Medical Society of Vienna, 1873. His attention had been drawn to the possibilities of this method of treatment by the following very curious incident

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<sup>1</sup> Read before the San Francisco County Medical Society, Oct. 11, 1904

On the 5th of March, 1872, a girl, aged 11 years, was admitted to the hospital for marked headache. Examination showed a suppurating wound encircling the entire head and containing an elastic cord which was forthwith removed. According to the patient's statement, she had often been severely punished by her mother-in-law for the untidy condition of her hair, and had sought long ago to avoid further chastisement by continuously wearing a net with an elastic cord stretched tightly around the head, thus preventing the displacement of the net. Symptoms of meningitis appeared at an early date, death occurring March 21st. The necropsy showed section of the soft parts and of the bones of the skull, as if made by a fine saw. With the exception of a few trabeculæ, the section of the cranium was complete.

Encouraged by this demonstration, Dittel immediately applied the elastic ligature in over 200 cases. Erectile tumors, anal fistulæ, ablation of cancer of the breast, ligation of vessels, prolapsus ani, phymosis, castration and amputation of the lower limb. Thus Dittel's contribution to the elastic ligature brought the method into prominence. Nevertheless, the priority belongs to Grandesso Silvestri. Even Dittel himself (Oct 7, 1873), with very commendable loyalty, publicly acknowledged the justice of Silvestri's claims. Contemporary German writers, for reasons unknown, fail to mention the latter incident.

Grandesso Silvestri used the elastic ligature in lateral intestinal anastomosis, but, finding it unsatisfactory, discarded it immediately. Gaston of Atlanta (1884), was the first to employ the ligature method for the establishment of a channel of communication between hollow viscera. His cholecystoduodenostomies by this method were not satisfactory, however, and Gaston voiced his preference for the suture method.

Shortly afterwards (1888) Bardenheuer reported a series of intestinal anastomoses with a round rubber cord, 1 to 15 mm in diameter, forming a chain ligature. In 1891 McGraw published his first address on the elastic ligature, simplifying Bardenheuer's technique but retaining the latter's round rubber ligature material.

Although ably and adroitly presented, the cause of the elastic ligature failed to make converts, and was soon abandoned by its chief advocate.

Then followed a series of researches by Russian sur-



geons Podres (1898) used two silk ligatures in the shape of a cross, thus obtaining a star shaped opening within four days Podres applied this method in two patients The result in one case was excellent, the second patient died on the sixteenth day Sokoloff, using the same method, reported three gastro-enterostomies with two failures to cut out

After several similar failures Podres modified his method by circumscribing a rectangular area 4x6 cm by means of four silk ligatures traversing all the gastric and intestinal layers Schalita, Sokoloff, Varnex and Tedoroff (1899) reported numerous gastric anastomoses by this method, but the results failed to convince other Russian or the Continental surgeons Poita (1899) modified McGraw's technique by using a rubber band and Raffa further complicated the question with two elastic ligatures Modlinski (1899) substituted rubber for silk in Podres' method In 1892 Postnikow proposed an oval excision of the seromuscular layers of the stomach and intestine, followed by ligation of the protruding mucosa \* Tiojanoff (1893) and Lauenstein (1894) each reported a success in men with this method Mugnai, a year earlier, had used the thermocautery instead of the knife, prior to ligating the mucosa

In 1901 McGraw reiterated his statements regarding the elastic ligature, and reported a series of successful trials with with what he calls "a method of my own invention" (N Y Med Jour 1901, p 133) While McGraw is in no sense the originator of the elastic ligature, he nevertheless deserves unstinted praise for having rejuvenated, made practical and ably advocated this very interesting question of operative technique

#### ELASTIC LIGATURE

*Size of the Elastic Ligature*—While the round rubber ligature used by Bardenheuer measured only 1.5 mm in diameter, that employed by McGraw measured 3 to 5 mm Our experiments on large dogs, and seven cases in man, proved conclusively the superiority of a much smaller size The flat rubber bands 1 to 2 mm in width, as are commonly found in

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\* This procedure was recently recreated by R C Coffey, of Portland, Ore (Medical News, Nov 4, 1905)

stationary stores, gave excellent results in intestinal anastomoses

*Quality of Rubber*—Pure rubber, capable of being stretched at least five times its length, should be selected

The usual rectangular mode of placing the elastic ligature is the quickest and safest. All other methods make irregular and small cut-outs

The plan of punching out a stoma originated with Bardenheuer (rubber-chain ligature). Podres sought to obtain the same effect by using silk ligature in triangles and squares

Subsequently the problem received some attention from C. M. Cooper, of San Francisco, and later from Weil and Maury, of New York, who recently disinterred the old method of Podres, rendering it still more complicated. In view of studying the merits of the punching-out plan, a large number of intestinal anastomoses were made with rubber, silk and twine, enclosing areas of diverse shapes—squares, rectangles, Greek stars, single and double triangles. The results showed a high mortality whenever the simple rectangular method was departed from and the rubber openings were invariably the most satisfactory. All anastomotic openings eventually become oval or circular

The mode of securing the knot suggested to McGraw by Hickey is, at best, a clumsy device. The more recent mode of tying the rubber with silk or thread is merely a modification of the procedure employed years ago by Sir Henry Thompson (1874). A simpler and equally safe method is to place a clamp on the rubber strands previously drawn taught, a silk ligature can then be placed beneath the clamp, the rubber cut short and the clamp removed without fear of the knot slipping

In a series of over 150 operations, comprising 12 different interventions on the stomach, intestine, gall-bladder and urinary bladder, rubber cord, 3 mm in diameter and flat rubber bands 1 to 2 mm in width and 1 mm in thickness were used, with the ordinary or the Reverdin needle

The time necessary for the elastic ligature to cut through, varied considerably. However, with a fixed degree of constriction the time required for the cut-out is directly propor-

tionate to the amount of tissue in the bight of the knot. This fact is well illustrated in Bardenheuer's method of gastro-enterostomy by elastic chain ligatures in which the cut-out takes place within two days.

The shortest time noted in any of the dogs was three days for the intestine and four days for the stomach. In the majority of dogs the cut-out took place in four days (stomach) and three days (intestine) in the early experiments, more time was required with cats (four to six days), but later the constriction was more properly made and the results resembled those obtained in dogs. Variations in the time of the cut-out may be partly due to the quality of rubber. Old or boiled rubber may lose much of its elasticity. The degree of constriction is undoubtedly the principal and most important factor.

In estimating results, the intestine will be considered independently of the stomach.

*Intestine*—The following sufficiently accurate mode of comparison was adopted.

1st, A series (5, 6, 7,) of lateral anastomoses were made at the same séance by the rectangular-ligature method with various materials,—rubber, silk, twine, plain and chromic gut, of various sizes.

2d, Several lateral anastomoses by the various suture methods,—the two-row suture the continuous or interrupted Connell suture.

Necropsy specimens of a large series of these experiments show

1st, A considerable number of failures to cut-out when No 1 catgut and No 1 silk are used.

2d, A few failures with linen thread of silk No 2 and 3.

3d, No failure with properly placed rubber.

4th, In one instance the rubber (1x1 mm) was found encysted, having evidently broken.

5th, The size and shape of the anastomotic opening were somewhat influenced by the nature of the ligature material. The opening produced by rubber exceeds all others in the transverse and longitudinal diameters.

6th In *successful* intestinal anastomoses the cut-out 1e-

quired more time with rubber than with any of the other materials, all of which could be handled more expeditiously and with a greater degree of immediate sero-serous approximation than rubber. The only somewhat bulky knot was that of rubber.

7th, The puckering of the gut produced by the ligature sometimes persists more than thirty days. This is particularly noticeable in intestinal anastomoses measuring more than 5 cm. In these cases the opening is seldom clean cut, on either side and in the middle third of the opening an elevated granulating fold will be frequently found as late as the fourteenth day.

This is more or less present at an early date in all methods of intestinal anastomosis. The elimination of the protruding parts between the two flaps of mucosa takes place by necrosis or by the destroying power of those crypts which have returned to their embryonic type (Mall).

8th, The stoma made with rubber can always be recognized, it is large, clean cut, and has a sharp, regular edge. The Connell stitch produces a much shorter and narrower stoma, owing to the constant presence of a bridge formed by the protruding intestinal layers. Regeneration of the mucosa is somewhat slower than with the elastic ligature.

9th, The classic two-row suture method makes a stoma comparing favorably in width and length with that made by rubber. It is, however, generally less regular in outline. Furthermore, regeneration of the mucosa requires more time, and omental adhesions are more pronounced than in both of the above methods of anastomosis.

No apparent contraction was noted in elastic ligature openings after a period of twelve and sixteen months\*.

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\*The observations of the Mayo Brothers regarding the closure of the anastomotic opening in cases of patulous pylorus were not substantiated in any of the dogs operated on and kept under observation for several months. Furthermore, the findings of the French, German and Swiss schools (Terrier, Hartmann, Montprofit, Kocher, Witzel and Roux) do not corroborate the Mayos' assertion. The occurrence of this complication in the Mayos' early cases suggests the presence of slight local peritonitis due to over-manipulation or possibly faulty suturing, causing an inordinate amount of granulation tissue.

The *modus operandi* of a successful anastomosis by the ligature method is conclusively illustrated by the inspection of the parts immediately after the operation. It will be noticed, first, on the peritoneal surface of the bowel, that the ligature material (silk or twine) has cut through the serous and mucous layers and the major portion of the muscular layers, leaving merely a few circular muscular fibres and some submucosa, second, on the mucous surface of the bowel, when the ligature fails to cut through the muscular layer, the submucosa retains its vascular supply, and consequently does not undergo necrosis. It would seem, therefore, that the bridges of tissue in the anastomotic opening, noted by all experimenters, are in part due to insufficient or irregular constriction of the parts involved. In other cases of totally inadequate constriction, the mucous surfaces show, after eight days a lineal scar of variable depth, when catgut is used, or two minute orifices, surrounded by scar tissue, in which the silk or twine (rectangular) ligature hangs loosely.

In view of the immediate destruction of the various intestinal layers by the use of the ligature method (silk or twine), several attempts were made to obtain an anastomotic opening by removing the ligature and then circumscribing the entire previously ligated area with Lembert sutures. Failure followed in all cases. A certain amount of necrosis occurs, but a lineal cicatrix will be found as early as the sixth day. Microscopic sections of specimens of one hour, one and two days, proved conclusively the impossibility of securing anastomosis by this method. Mention is made of these negative results in view of the recent erroneous statements of Werelius (J. A. M. A., 1904).

*Stomach*—Rubber cord, 2 or 3 mm in diameter, placed in the usual rectangular manner, never failed to cut-out. In all cases inspected during the first and second days the pyloric end of the stomach seemed to be in a state of contraction. This condition was not present on the third day. Dilatation of the stomach was present in a few cases during the first and second days.

For comparative purposes, ten dogs and six cats were sub-

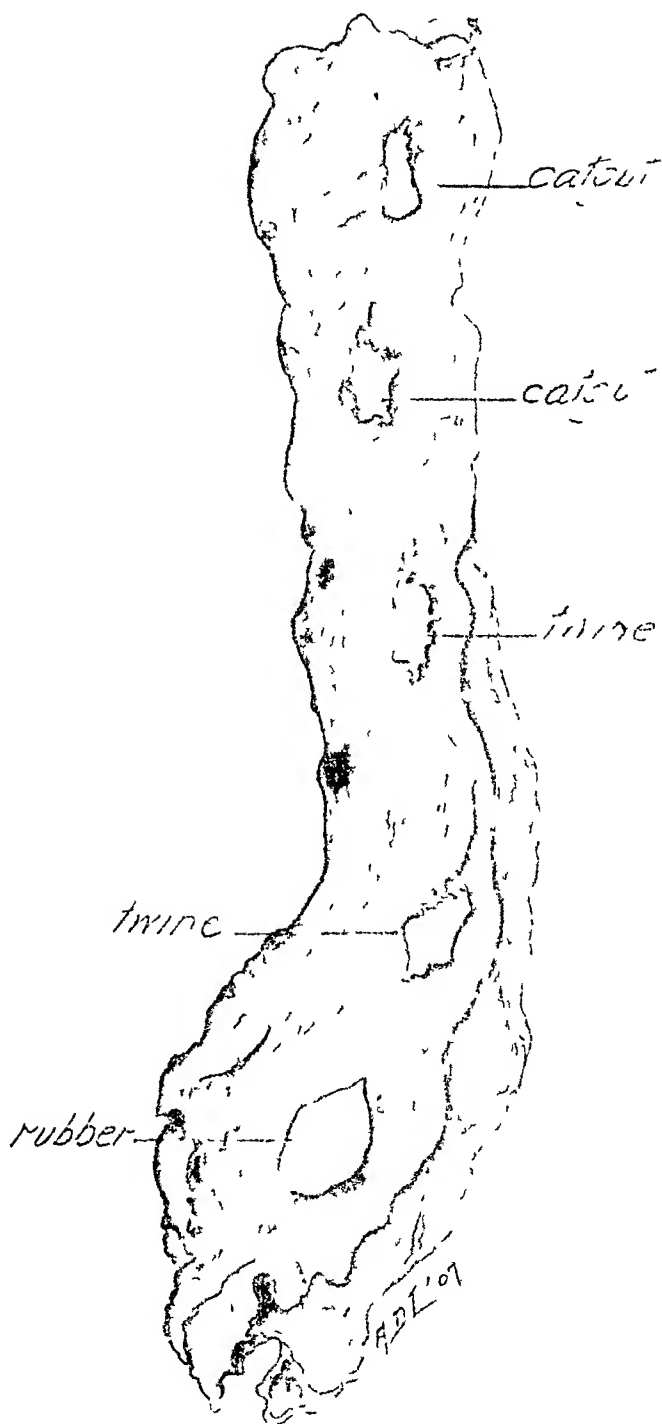


FIG 1 —Natural Size

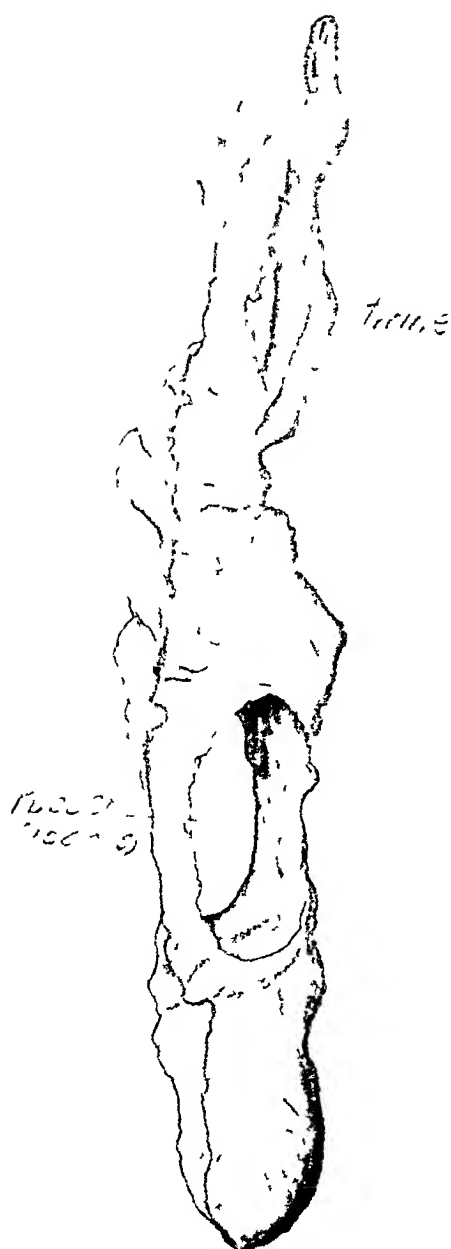


FIG 2 —Natural Size

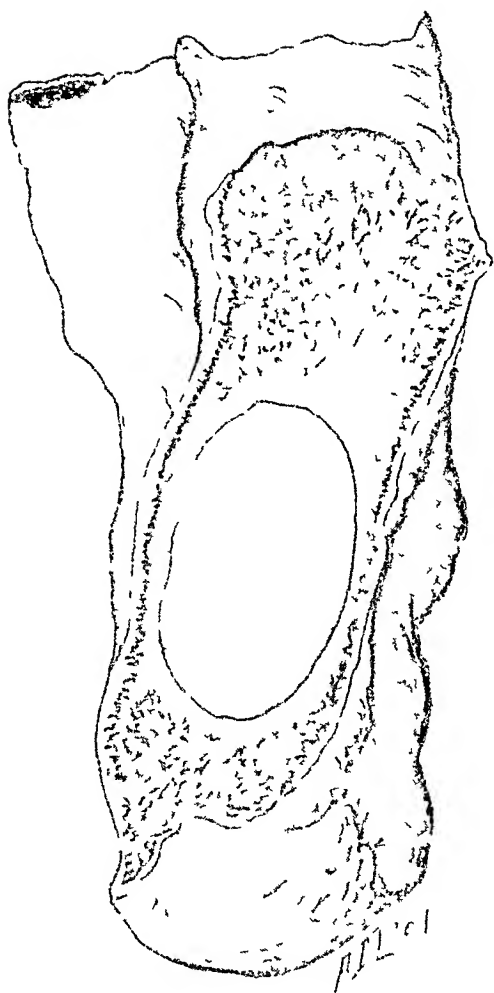


FIG 3—Rubber—15 days





FIG 4—Two-row Suture (10 days )

jected to a gastroduodenostomy (Villard, Kocher) and simultaneously to a posterior gastro-enterostomy. Rubber, in rectangle, was used for one operation, and twine, in triangles, for the other. The results were uniform. Aside from being far less expeditious, twine in triangles proved less safe, more bloody, necessitated more extensive sero-serous suturing, caused more pronounced and more lasting kinking of the gut and more irregularly shaped and no larger openings than the elastic ligature used in the usual rectangular manner. Failure to cut-out was occasionally noted with twine.

We feel, therefore, justified in condemning all attempts to render difficult and dangerous a very simple and safe procedure.

In view of studying the degree of shock resulting from the use of the ligature method, the following operations were performed at one séance on a pregnant slut: 1 gastro-enterostomy, and 2 entero-enterostomies. Evidence of pain during the first 36 hours was the only noticeable feature,—the animal ran about as usual on and after the third day, and gave birth to five pups of normal size on the seventh day.

The following was done on a male dog: 1 cholecysto-gastro-enterostomy, and 4 lateral anastomoses.

In a third case eight lateral anastomoses were made. These dogs remained without food for two days, then gradually resumed their normal state and were subsequently re-operated, in one case as many as six times. Anastomosis made under local anesthesia caused very marked pain when twine or silk was tied in triangles or squares. With rubber, in rectangle, pain was much less apparent.†

*Speed*—The ligature (intestinal) can be placed, tied and cut within fifteen seconds, and an additional anterior supporting mattress suture requires about the same length of time.

A series of over fifty ligature operations (catgut, silk) show that protecting sutures are not indispensable in intestinal anastomosis. Under these circumstances omental adhesions were seldom noticed, and in cases of reoperation after thirty

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\* Finney's operation can be done with the elastic ligature, but failures are not infrequent.

† Halsted and Mall noticed that sero-serous union frequently took place before the operation was completed.

days none was found. The posterior row of protecting sutures is entirely superfluous in view of the perfect sero-serous approximation, and the sole purpose of the anterior suture is to cover an immoderately large knot. Microscopic sections show clearly the advantages of protective sutures when rubber is used, although they may be dispensed with, as proved by a long list of successful gastric anastomoses in the dog. However, when considerable tissue is included in the bight of the ligature supporting sutures are in order. Under such circumstances a posterior row and a single anterior mattress suture will prove expeditious and thoroughly adequate.

These facts are rather significant when we recall Gregory Connell's loud utterances relative to the "knot within the bowel," a feature which made but little impression on experienced American surgeons and none at all on foreign surgeons. As early as 1889 Chaput proved the absence of ill results from through and through intestinal sutures with the knot outside of the bowel, and subsequently Sonnenberg advocated and successfully practiced a similar method in appendicectomy.\*

Convinced of the reliability of the results of experimental findings in the question of supporting sutures, we made (Aug., 1904) a lateral anastomosis in the pelvic colon in order to circumvent the consequences of a kink following the resection of a sarcoma of the bowel. Braided silk was used in the usual rectangular mode, and a single narrow mattress catgut suture sufficed to cover the knot. Immediate and final results were perfect, no peritoneal reaction was noted. The patient passed gas the first day and had a large formed evacuation of the bowels the sixth day. Having eleven months previously made a lateral anastomosis in this patient by the two-row suture method, we were able to appreciate the simplicity of the ligature method.

The claim that union by first intention occurs with the elastic ligature in gastro-intestinal anastomosis is most easily disproved by the very elementary consideration of pressure

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\*It is not commonly known that the essential part of the so-called Connell suture—the through and through continuous stitch—is due to M. E. Connell (1888). Gregory Connell modified his father's suture by placing the knot within the lumen of the gut.

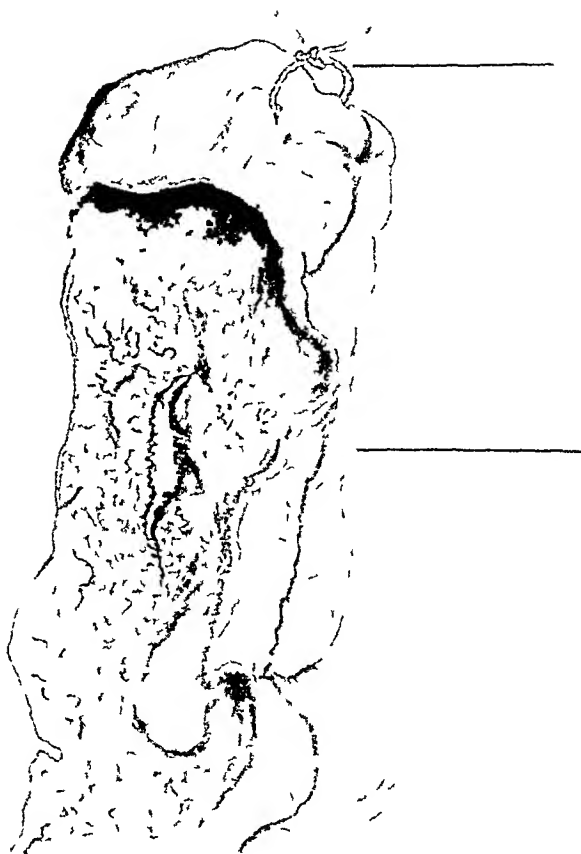


FIG 5—Twinc (rectangular)



FIG 6—Gastro duodenostomy and Gastro enterostomy

necrosis in a septic medium like the intestinal canal. Furthermore, microscopic sections of ligature specimens of two to three weeks, frequently show a marked gap of granulation tissue between the gastric and intestinal epithelial borders.

Again, it is stated that there is no escape of feces and therefore no exposure to peritoneal infection from the bowel contents. Inspection of the portion of the ligature which has traversed the bowel will invariably show the presence of feces in the unprepared cases, and culture tubes inoculated with the rubber in question always give a luxuriant growth of bacteria in the prepared cases. It may, therefore, be safely asserted a priori that asepsis neither exists during nor after an operation with the elastic ligature.

*Circular Ligature*—The results of circular ligature in the intestine were first noted in the clinical studies of several French surgeons, Quénu, in particular, and their findings were confirmed experimentally by Genersich, in Germany, and by my clever friend, J. Henry Barbat, of San Francisco.

The results vary according to the condition of the bowel, in cats previously purged or starved for twenty-four hours, a tight ligature causes a necrotic process similar to that described in lateral anastomosis by the ligature method. The serosa completely covers the ligature within 36 hours, and on or about the fifth day the ligature passes into the intestine, the lumen of which becomes pervious as early as the 9th day. When the ligature was left loose, it remained *in situ*, and always failed to pass into the gut, death occurring from inanition sometimes as late as the nineteenth day. No signs of ileus or peritonitis were noticed in either of the two foregoing groups of experiments. In unprepared animals early death from toxemia frequently resulted. No peritonitis was present at necropsy.

The preceding statements were verified by three varieties of experiments.

1st, A ligature (silk or rubber) was placed on the afferent loop in von Hacker's gastro-enterostomy with entero-enterostomy.

2d, Lateral anastomosis between the ileum and pelvic colon with ligature on distal end of ileum (Barbat).

3d, Circular ligature on the small intestine (Genersich),

or colon Specimens from all three varieties of cases show the lumen of the gut almost normal in diameter with a lineal scar plainly apparent beneath the serous coat

In the domain of vascular anastomosis the ligature method proved very serviceable (Eck's fistula and Carrel's anastomosis between the carotid artery and jugular vein)

While our clinical experience does not permit us to speak authoritatively on the indications of the use of the ligature method, a few facts may nevertheless be deduced from animal experimentation and an extensive study of the published clinical cases

The *ligature anastomosis* is the quickest to make and the slowest to functionate Hence, we should never resort to this method when an immediate effect is required *Its field of usefulness is unquestionably in the various lateral intestinal anastomoses Here the ligature method may become the method of choice* Its adoption may be of service in the following conditions Strangulated hernia, artificial anus, inoperable obstructive tumors of the intestine, as a preliminary step in the resection (Kocher) of large intestinal neoplasms

In certain gastric conditions (incomplete pyloric stenosis, inveterate dyspepsia, ulceration) the elastic ligature may prove of service, but we should not overlook the fact that in these conditions the suture method in the hands of experienced men has proved eminently safe and satisfactory

In incomplete malignant pyloric stenosis, the elastic method may prove useful at an early stage, but in late cases feeding cannot be retarded, and acute dilatation may prove dangerous Not the least of the objections to the ligature method are the tendency to do a palliative operation rather than a radical or curative one and the frequent abuse of an apparently simple operative method

The perusal of the published reports of the elastic ligature demonstrates the absurd use made of the method, especially in this country, for complete pyloric obstruction of benign or malignant origin It were indeed truly difficult to preconize

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\* Our elastic ligature operations in man comprise three posterior gastro-enterostomies and four lateral intestinal anastomoses, all very successful

a more perfect mode of fasting in a condition of advanced starvation

In complete pyloric stenosis, whether of benign or malignant origin, the ligature method is to be severely condemned.<sup>1</sup> All dogs and cats subjected to a ligature gastro-enterostomy and occlusion or exclusion of the pylorus, died of convulsive auto-intoxication. Chas Mayo and Mauney report similar experimental findings.

While anastomosis by the ligature method belongs logically to the class of operations in two stages, all of which have for obvious reasons been gradually abandoned, notwithstanding their apparent advantages, sufficient evidence, both experimental and clinical, has been adduced to render unquestionable the superiority of the elastic ligature in various lateral intestinal anastomoses.

On the other hand, the ever-increasing *functio operandi* and particularly the surgeon's surreptitious invasion of the medical man's domain—gastric ptosis and atonic dilatation—call for simple and truly safe surgical measures. The elastic ligature apparently fulfils both of these conditions, but prolonged clinical experience alone can determine its practical value, its indications, its limitations, and, while its simplicity of technique may render it popular with surgeons unduly fearful of peritoneal contamination and unskilled in the use of the needle, experienced men cannot, barring rare circumstances, be expected to give preference to "devices that work while the surgeons are asleep."

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\* In the skillful hands of Ochsner the elastic ligature gave five deaths in a series of 28 patients with malignant obstruction of the pylorus



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# THE REVERSAL OF THE CIRCULATION IN A LIMB

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## I INTRODUCTION

THE circulation may be said to be reversed in a limb when the red blood flows through the veins in a direction opposite to the venous normal circulation, and the dark blood returns towards the heart through the arteries

The reversion may be brought about by cutting the main artery and vein of a limb and uniting the central end of the artery to the peripheral end of the vein and the peripheral end of the artery to the central end of the vein. Then from a functional point of view, the vein becomes an artery, and the artery a vein. The capillary circulation is also reversed

## II OBJECT

These experiments have been undertaken with the view, both physiological and surgical, of studying the changes of the circulation of the limb after reversal, and of finding a method of preventing gangrene, when the arteries of a limb become unable to carry the red blood to the capillaries

## III HISTORY

The reversal of the circulation in the saphenous vein of a dog was attempted by Dr Berard, associate professor of surgery in the University of Lyons, and Carrel, in 1902, in the laboratory of A Lumière. The femoral artery and the saphenous vein having been cut in Scarpa's triangle, the central end of the artery was connected by circular suturing<sup>1</sup> to the peripheral end of the vein. After restoration of the circulation, the saphenous vein appeared greatly distended and pulsating,

pulsations being easily perceived even in its course in the leg below the knee. The animal died from infection two days after the operation.

Afterwards, in the laboratory of Professor Soulier, Carrel and Morel succeeded in reversing the circulations in the jugular vein.<sup>2</sup> The carotid artery, and the external jugular vein, having been cut, the central end of the carotid was united to the peripheral end of the jugular, by circular suturing. The jugular became red, distended, and pulsated like an artery. By auscultation, a strong systolic murmur was heard at the anastomosis. The animal was under observation for several months after the operation, and during this time the vein maintained its arterial functions.<sup>3</sup>

Prior to this, in the same year, a Spanish surgeon, San Martín y Satiustegui,<sup>4</sup> attempted to establish a lateral anastomosis between the femoral artery and vein in three goats. Obliteration of the vessels occurred. Afterwards he performed this operation on two patients affected with gangrene of the lower limb. In one case the operation was entirely unsuccessful. In the other, the gangrene stopped, but this was probably due to the fact that the affected portion was amputated at the time the anastomosis was performed.

After these first experiments, a French surgeon, Professor Jaboulay, established a lateral anastomosis of the femoral vein and artery, in a patient suffering from gangrene produced by endarteritis.<sup>5</sup> The operation was not successful, and an amputation became necessary.

In 1903, Gallois and Pinatelle, assistants of Jaboulay, published the results of this operation and of the experiments which they had made in order to investigate the possibility of the reversal of the circulation.<sup>6</sup> Their experiments were performed on a cadaver. A colored fluid was injected under pressure into the main vein of a limb. The fluid returned immediately by all the other veins of the limb. After occlusion of these veins by forceps, it was impossible to cause the fluid to flow through the main vein. They conclude that the cir-

culatation of a fluid through the main vein of a limb, in a direction opposite to the normal circulation, cannot be established, owing to the presence of the valves, and that joining the central end of the artery to the peripheral end of the vein is not justifiable

In this paper the possibility of the reversal of the circulation, and the nature of the operation necessary to bring it about, will be discussed

#### IV POSSIBILITY OF THE REVERSAL OF THE CIRCULATION

In order to flow through the veins in a direction reverse to the normal, the red blood must overcome the following three physical obstacles

(a) The valves,

(b) The numerous anastomosing veins, which decrease the blood pressure by increasing the area of the cross-section of the vessels,

(c) The resistance of the capillaries

Logically, owing to these obstacles the reversal seems impossible. Besides, the experiments of Gallois and Pinatelle indicate that the red blood cannot get beyond competent valves. But their experiments were made on a cadaver. Before adopting their conclusions, therefore, it is necessary to consider that the living tissues have a very strong power of adaptation, and to therefore experiment on the living animal. With this view the two following experiments were performed

EXPERIMENT I—Interposition of a segment of the femoral vein between the two cut ends of the femoral artery with reversal of the circulation in two collaterals of the vein (7)

May 12, 1905 Medium-sized, strong young bitch

*A Technique* (summary)—Etherized dog. Four centimetres below Poupart's ligament the femoral artery was sectioned. A displaced segment of the femoral vein was interposed between the two ends of the artery, which restored its continuity. This venous segment had two branches, one of which received the dark blood from the adductors, the other from the quadriceps (Fig 1, p 206)

After restoration of the circulation, Scarpa's triangle was dissected

The edges of the wound having been joined by means of several forceps, the skin was covered with hot moist compresses. From time to time the wound was reopened, in order to observe the state of the circulation.

*B Results* On release of the clamps on the vessels, the red circulation was immediately established through the venous segment. But the two small collaterals—the vein of the adductors, and the vein of the quadriceps—remained filled with dark blood.

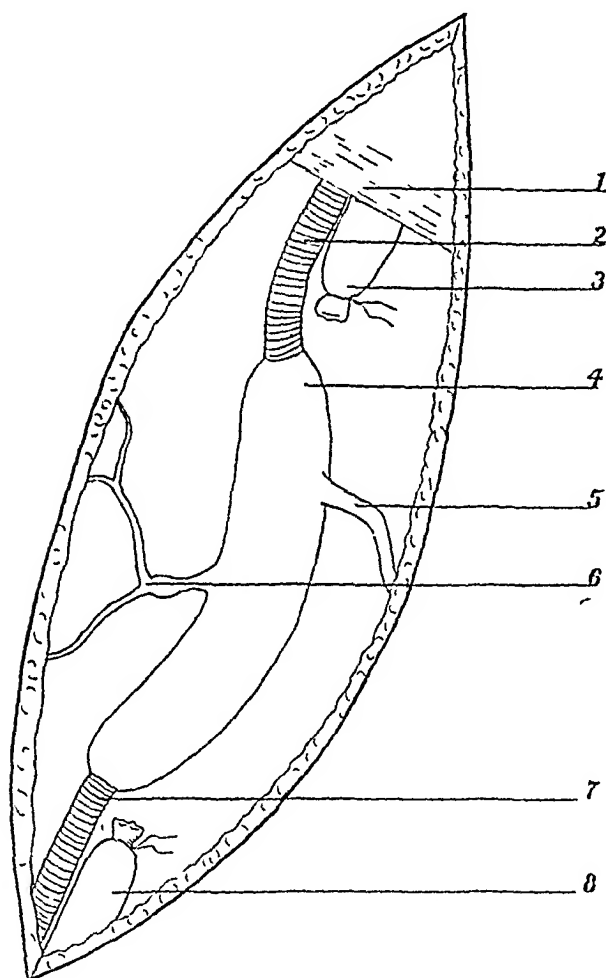


FIG 1.—Interposition of a segment of the femoral vein, between the cut ends of the femoral artery. 1, Poupart's ligament, 2, femoral artery, 3, femoral vein, 4, a vein from the adductors, 5, a vein from the quadriceps, 6, peripheral end of the femoral artery, 7, peripheral end of the femoral vein.

*Fifteen minutes after the operation* the red blood had entered the vein of the adductors and pushed the dark blood towards the periphery. A portion of this vein about 3 cm long and located near the femoral

vein assumed an arterial hue and pulsed strongly. The peripheral ramifications near the muscles were yet filled with dark blood. On making a pressure with the hand upon the adductors, in order to increase the blood pressure in the peripheral ramifications of the vein, the dark blood forced all the red blood out of the collateral vein into the venous segment. On release of the pressure upon the muscles, the dark blood was again displaced by the red blood and filled the vein to its peripheral ramifications, the latter remaining dark. The line separating the red from

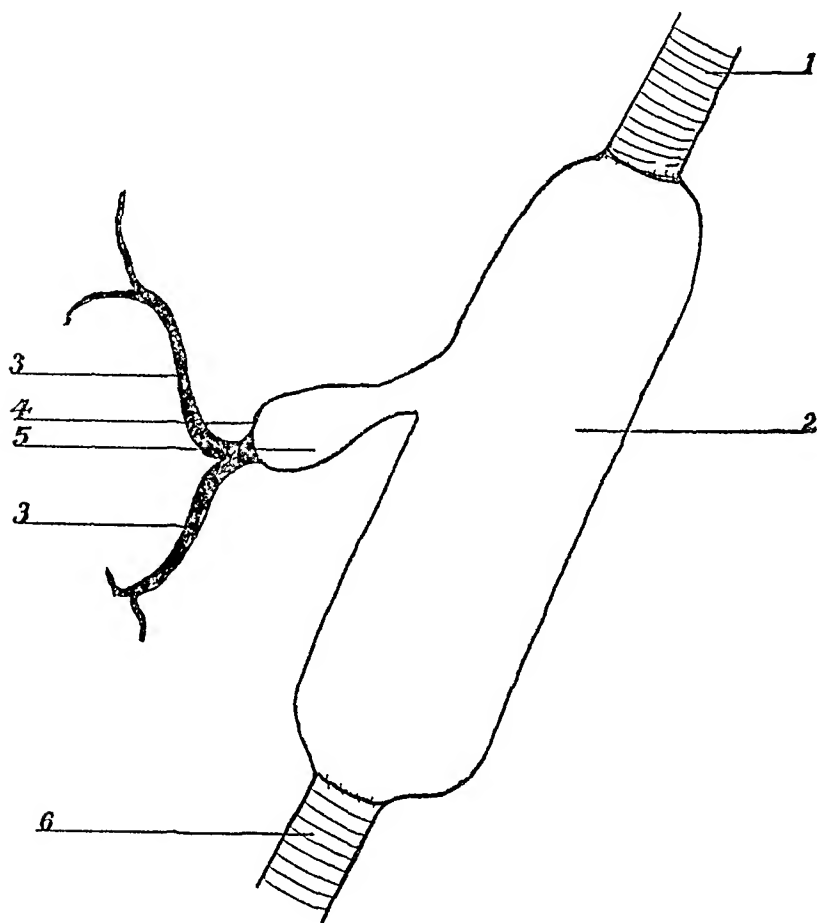


FIG 2—Reversal of the circulation through a small valvular vein, one hour after the operation, the valve being not yet forced. 1, central end of the femoral artery, 2, a segment of the femoral vein, 3, small venous branches filled with dark blood, 4, valve, 5, vein filled with red blood, 6, peripheral end of the femoral artery.

the dark blood was stationary. Therefore, no arterial circulation through the vein of the adductors occurred up to this time.

The vein of the quadriceps was filled with dark blood. Near its mouth, a small dilatation was observed, above which the blood was red and below which it was dark (Fig II). This dilatation was pulsating like a small aneurysm. Its lower end marked the location of a valve.

When pressure was made upon the muscle the dark blood, passing through the valve, flowed into the red current of the femoral vein. On release of the pressure the red blood penetrated again the dilated portion but did not pass beyond the valve.

One hour after the operation the adductor vein and its peripheral ramification had become red. The fine branches appeared like small arteries, after having been dissected out from the muscles as far as pos-

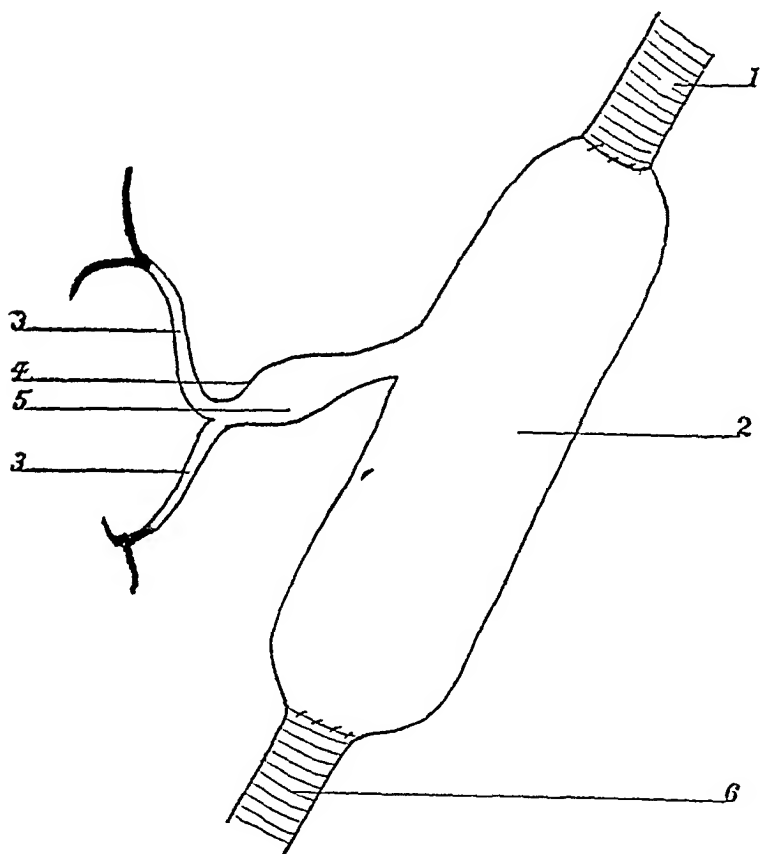


FIG 3.—Reversal of the circulation through a small valvular vein, two hours after the operation, the valve being forced. 1, central end of the femoral artery, 2, a segment of the femoral vein, 3, small venous branch filled with red blood, the dark blood being compelled to flow towards the periphery, 4, forced valve, 5, vein filled with red blood, 6, peripheral end of the femoral artery.

sible. There was no circulation of red blood through the vein of the quadriceps.

Two hours after the operation the red blood was seen to pass through the valve of the vein to the quadriceps and to push the dark blood outward, (Fig III) but it appeared to stop before reaching the peripheral portion

of the vein and the fine intra-muscular branches, which remained filled with dark blood

*Two hours and a half after the operation* all the peripheral and intra-muscular ramifications had become red. It was not observed if the small artery of the adductors was filled with dark blood at this time

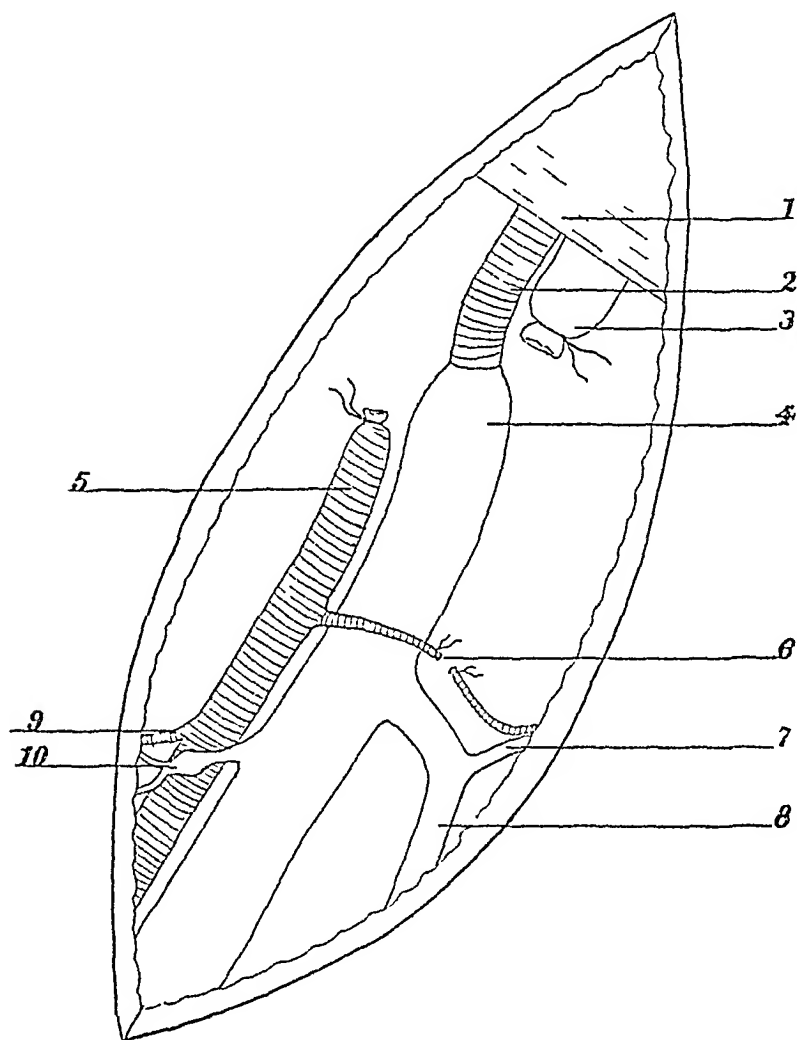


FIG 4—End to end anastomosis of the central end of the femoral artery to the peripheral end of the femoral vein. 1, Poupart's ligament, 2, central end of the femoral artery, 3, central end of the femoral vein, 4, peripheral end of the femoral artery, 5, peripheral end of the femoral vein, 6, an artery to the adductors, 7, a vein from the adductors, 8, sphenous vein, 9, an artery to the quadriceps, 10, a vein from the quadriceps

EXPERIMENT II—Reversal of the circulation in a limb June 22, 1905  
Medium-sized, very strong young bitch

*A Technique* (summary) Etherized dog Two centimetres below Poupart's ligament the femoral artery and vein were cut, and the central



end of the artery united to the peripheral end of the vein, by circular suturing (Fig IV, p 209)

After restoration of the circulation, the saphenous vein and its collaterals, the femoral vein, the deep veins of the leg and their collaterals, the superficial veins of the foot, the femoral artery and the small arteries of the adductors and of the triceps, were dissected out. Afterwards the edges of the incision were joined by means of forceps, and hot moist sponges were placed over the part. From time to time the wound was reopened, and the condition of the circulation observed.

*B Results* Immediately after the operation, the arterial blood, passing through the anastomosis, flowed into the femoral vein, which assumed an arterial hue and became very distended. To the touch, strong pulsations were manifest.

The arterial blood did not enter the mouth of the saphenous vein, which was situated in Scarpa's triangle near the apex. The blood in the saphenous vein remained dark. Its walls were distended, owing to stasis of the venous circulation and to the increase of pressure in the femoral vein. No pulsations were perceptible to the touch. Three centimetres below its mouth, a branch was given off to the adductor muscles. This collateral was dark and did not pulsate.

*Fifteen minutes after the operation* the walls of the femoral vein were less distended. In the popliteal region the vein divided into two branches, one of which was red, the other dark. The saphenous and the superficial veins of the thigh, of the leg, and of the foot were distended with dark blood and did not pulsate.

While inspecting the circulation in the veins, the first valve of the saphenous vein was seen to give way. The red blood slowly entered the mouth of the saphenous vein, pushed the dark blood toward the periphery as far as the mouth of the adductor vein, and then stopped. Immediately below this point a little dilatation filled with red blood was observed. The lower end of this dilatation marked the location of a valve—the second valve of the saphenous vein—below which the vessel was filled with dark blood. Almost immediately the arterial circulation was established through the adductor vein, which became red and began to pulsate.

*About thirty minutes after the operation* the lower portion of the saphenous vein suddenly became filled with red blood, which flowed towards the upper portion of the vessel, i.e., centrally. Thus, the whole vein became filled with red blood, but the direction of the current was not the same in the superior and the inferior portions of the vessel. By pressing the blood from the superior segment of the vein, and then removing the pressure in order to allow the circulation to become re-established, it was seen that the red blood was flowing from the femoral vein to the vein of the adductors, but that it was unable to get beyond the second valve of the saphenous.

The same experiment showed that, in the portion of the vessel located below the second valve, the blood flowed from the periphery to the

centre, *i.e.*, in the direction of the normal venous current. The red blood entered the lower part of the vein through the anastomoses between the deep veins of the leg, but all the valves of the saphenous vein were not yet forced. All the superficial veins were yet dark. On each of them and very close to the saphenous, a small dilatation filled with red blood was observed.

*An hour after the operation* a small branch from the femoral artery accompanying the vein to the adductor muscles was doubly ligated near its origin and cut between the ligatures. A small opening was then made through the wall, just peripheral to the distal ligature. At first no blood escaped, but about fifteen minutes later, dark blood began to escape, and the rate of flow gradually increased.

The peripheral end of the femoral artery immediately below the ligature was then hemisected. A large hemorrhage of red blood occurred, in which it was possible to see several lines of dark blood, the whole being comparable to the mingling of the water of a small, muddy stream with the clean water of a large one.

*Two hours after the operation*, dark blood flowed from the branch of the femoral artery to the adductors, on opening the wound in its wall. A transverse section of the peripheral end of the femoral artery gave rise to a large hemorrhage, consisting of red and dark blood in about equal proportions.

*Three hours after the operation* the saphenous and femoral veins and most of their branches were filled with red blood and pulsated like arteries. Almost all the valves of the saphenous were forced, but when it was emptied by pressure it was observed that the red blood flowed more easily upward than downward, and that the second valve had not been forced.

The artery of the adductors was dark, and had the appearance of a vein. An incision of its wall gave an abundant hemorrhage of dark blood only.

The femoral artery was distended, without pulsations, and of a venous hue. Hemorrhage produced by a lateral wound consisted mainly of dark blood, but in it could be seen a few lines of red blood. All its collaterals were filled with dark blood excepting a deep one coming from the posterior part of the thigh, which remained filled with red blood.

*Four hours after the operation*, the femoral vein and its collaterals, the saphenous vein, and the veins of the leg and foot, were filled with red blood, but a large collateral in the popliteal region and a few small collaterals along the course of the saphenous vein remained filled with dark blood. If pressure was made on the muscles, the dark blood in the collaterals of the saphenous vein entered the main trunk, where it could be seen through the vessel-wall as a black line in the red blood. This shows that the blood-current through the lower part of the saphenous was directed upward (central), as far as the mouth of the adductor vein, and that, from this point to the femoral vein, the current was downward (peripheral). The second valve of the saphenous had not yet been forced.

Abundant hemorrhage of dark blood from the artery of the adductors was observed on opening the vessel-wall. The femoral artery was distended by dark blood, which was mingled with a very small quantity of red blood which came from an anastomosis with the arteries of the posterior region of the thigh.

The dog was killed five hours after the operation.

These two experiments demonstrate that

(a) The valves prevent, at first, the reversion of the circulation in the veins

(b) After a short time, the valves gradually give way and the red blood flows through the veins as far as the capillaries

(c) Finally it passes through the capillaries, and the arteries are filled with dark blood. Probably dark blood also returns from the capillaries towards the heart through some veins

(d) Practically complete reversal of the circulation is established about three hours after the operation

## V THE OPERATION PROPER TO ESTABLISH THE REVERSAL

The above experiments show that the main artery and vein of a limb having been cut, the anastomosis of the central end of the artery to the peripheral end of the vein produces the reversal of the circulation. The operation is completed by uniting the central end of the vein to the peripheral end of the artery, in order to permit the dark blood, which fills the artery when the circulation is reversed, to reach the heart. Perhaps it is not absolutely necessary to perform this second anastomosis, for the dark blood may come back from the capillaries to the heart through other veins. Further observations on this point will be made.

Another operation, consisting of a lateral anastomosis between an artery and vein, without occlusion of the trunk of either vessel, will be discussed, for the reason that it has been used,—unsuccessfully, however,—with a view almost similar to ours.

In order to determine the result of this operation, the following experiment was performed

*Lateral anastomosis of the femoral artery and vein* July 7, 1905  
Small-sized, strong young dog

*A Technique* (summary) Etherized dog A lateral anastomosis was established between the femoral vein and artery in Scarpa's triangle on the right side Temporary hæmostasis being accomplished by means of suitable artery forceps, a longitudinal incision about 12 mm long was made through the wall of the artery and vein The posterior edges and afterwards the anterior edges of the wound, were approximated by a continuous suture The opening between the artery and the vein was about 1 cm long

A short time after the operation the arteries and the veins of the limb were carefully dissected and observed

*B Results* After removing the clamps on the vessels, the red blood flowed through the anastomosis from the artery to the vein, and the latter became distended This anastomosis did not produce stenosis of the arterial channel, the circulation through the artery below the anastomosis apparently being normal

*Ten minutes after the operation*, above the anastomosis, the vein was red and to the touch, systolic pulsations were manifest Almost immediately below the anastomosis, the vein became darker, and one and one-half cm lower it presented the normal hue of a vein It was markedly distended, but no pulsations were observed The saphenous vein, in its inferior portion, was distended, but without pulsations

*Sixty minutes after the operation* there was a normal red circulation through the artery An active red circulation through the central end of the vein was observed No circulation through the peripheral end of the vein could be seen Below the anastomosis, the first three centimetres of the vein had become red The walls were distended and pulsating as far as the inferior part of the thigh, but obviously there was no circulation, for the hue remained venous

The adductor vein, the mouth of which was about two centimetres below the anastomosis, was dark and distended

No red circulation through the superficial veins of the foot, or through the saphenous vein Phonendoscopic auscultation showed

(a) On the central end of the artery, a strong continuous murmur with rude systolic increase,

(b) On the central end of the vein, a very strong systolic murmur,

(c) On the peripheral end of the artery and of the vein, a continuous murmur

On clamping the peripheral end of the vein, no modification of the continuous murmur by auscultation on the anastomosis could be detected When the clamp was placed on the central end, the continuous murmur ceased immediately, and was succeeded by a systolic murmur

*Two hours and forty minutes after the operation*, above the anastomosis, and also, as far as 4 cm below the anastomosis, the vein was red and pulsated strongly, but in the inferior part of the thigh it was dark. The adductor vein was dark, distended and pulsating. Near the mouth a small red column, about 1 cm long, was observed. The saphenous vein was dark and congested. No red circulation could be detected through the vein of the foot.

A lateral opening made through the wall of the inferior portion of the femoral vein produced a large hemorrhage of dark blood. A complete section of a vein of the foot produced a large hemorrhage entirely of dark blood.

*Three hours after the operation* no evidence of a reversal of the circulation could be detected. At this point the experiment was discontinued, and the animal killed. The post-mortem examination showed a large communication, about 1 cm long, between the artery and the vein.

This experiment demonstrates that

(a) After lateral arterio-venous anastomosis a very large portion of the red blood returns immediately toward the heart through the central end of the vein.

(b) The peripheral portion of the vein and its collaterals are distended and pulsate, but the valves are not forced and the red blood does not circulate through them.

(c) Three hours after the operation, all the valves are yet competent, and no beginning of the reversal of the circulation can be detected.

## VI CONCLUSIONS

1 The reversal of the circulation in a limb of a dog is possible.

2 It can be established by an end to end arterio-venous anastomosis.

3 Under the same conditions, the lateral anastomosis does not establish the reversal of the circulation.

The permanent results of these operations, a series of which are being performed under aseptic technique in this laboratory, will be published later. If normal nutrition of the limb were possible, and the results of the end to end anastomosis permanent, the operation would perhaps be proposed.

for the preventive treatment of gangrene following obliteration of the arteries

We wish to thank Dr Stewart for granting us the privileges of this laboratory

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# CARCINOMATOUS METASTASES DEVELOPING OVER THREE YEARS AFTER REMOVAL OF THE BREAST WITHOUT LOCAL RECURRENCE<sup>1</sup>

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Of fundamental importance in the decision of the question of the curability of cancer by operation is the localized character of the growth. When metastasis has occurred, no matter how thorough the removal of the primary tumor, the continued growth of the secondary deposits will nullify our efforts to obtain a cure. The modern methods enable us to cope with extensive local disease, and to follow it to the nearest lymph nodes with a reasonable hope of thorough eradication, and of freedom from recurrence. But a single distant metastatic deposit renders us practically helpless.

If the presence of a secondary deposit in a situation whence it can be removed by excision of the tumor, or ablation of the affected part or organ, is recognized at the time of proposed removal of the primary tumor, three questions arise: 1st, Shall we remove the primary tumor alone? 2d, Shall we remove both primary and secondary tumors? 3d, Shall we decline any operation?

(1) In certain cases the primary tumor causes symptoms which seriously inconvenience the patient or threaten life, and then the tumor should be removed if the operation is not too severe, even when the secondary tumor cannot be removed. As there is no hope of a radical cure, extensive operations are not advisable, and, fortunately, comparatively slight operations afford the desired relief in such cases.

(2) Under certain circumstances, as when the patient is in vigorous condition, when both primary and secondary tumors are easily removable, and when there is absolutely no

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<sup>1</sup> Read before the New York Surgical Society, October, 1905

sign of other deposits of the disease, we might venture on the thorough removal of both tumors. The justification for this course lies in the abundant evidence in careful postmortem examinations that a single secondary tumor may reach a very full development, even sufficient to cause death, without any other metastatic deposits, and that this may occur even while the primary focus is still limited in extent and easy to remove. Such single secondary deposits may develop in the kidney, the other breast, or in a distant bone of the extremities, from a primary carcinoma of the breast, and all of these lesions might offer an opportunity for successful surgical treatment.

(3) But in my personal experience I cannot recall a case in which the conditions were such as to justify removal of a distant secondary tumor at the time of operation on the primary tumor. Even when the secondary tumor appeared or was discovered after successful removal of the primary focus without local recurrence the conditions have never warranted operation. In every case the patients' general condition has been poor or it seemed probable that other secondary deposits existed although they were not evident. We must conclude, then, that in practice one will rarely meet with a case of malignant disease in which it will be good surgery to remove both the primary lesion and a distant metastasis.

The occurrence of secondary deposits which gave no symptoms and could not be recognized at the time of operation for the original disease, but soon became evident afterwards is unfortunately very common. We need only emphasize the necessity for a careful examination of the entire body before undertaking the removal of a malignant growth, in order to discover, if possible, any such secondary tumors.

Our results in the removal of malignant growths have so greatly improved that we feel fairly confident of freedom from local recurrence if the operation can be performed before the disease has spread too far. This freedom from local recurrence is often spoken of as a cure of the disease and in fact a permanent cure is often effected. But in the individual case we are still uncertain as to the length of time which should elapse without local recurrence before the patient can be considered free from danger of any return. When operations



were less complete and thorough than they now are, the number of patients who remained well for three years or more was not very great. It is not surprising, then, that late recurrences locally, or late appearance of secondary tumors, were rarely observed. Now, however, a very large number of persons have survived for long periods after the removal of the primary tumor, and there must be an increasing number of cases with late recurrence. This is indicated by the fact that there is a constant demand for a lengthening of the period which must elapse before a cure can be claimed, even limiting the question to the local or regional recurrences. The old period of three years of freedom from recurrence has been generally discarded and we hear demands for five years, ten years, or even longer periods. If we take into consideration not merely the local recurrences, but include the late-appearing metastases, ten years is not too long, as shown by the following cases operated upon by me. I have reported only those cases in which the secondary deposits were observed three years or more after the removal of the primary tumor, without local recurrence.

CASE I—Annie C, thirty-seven years of age, married, born in Ireland. Carcinoma of left breast, with slight axillary involvement, removed October 11, 1889, at St Luke's Hospital. A recurrent nodule formed in the scar and the latter with the entire pectoralis major muscle was removed January 13, 1890. The other breast became carcinomatous and was removed with the pectoralis major December 16, 1892. Dr H H Robinson, of Goshen, examined her and kindly reported November 18, 1895, that there was no sign of recurrence. Soon after vague symptoms of intrathoracic complications arose and she died August 25, 1896, of a secondary tumor in the mediastinum, pushing forward and involving the ribs and sternum on the left side, nearly four years after the last operation. (Letter from Dr T D Mills, of Middletown.)

CASE II—Florence A C, thirty-eight years of age, widow, born in United States. Carcinoma of right breast, numerous small glands in axilla. Removed breast and axillary contents March 22, 1894, at the General Memorial Hospital. The wound became slightly infected but healed in about four weeks. She

remained well until February, 1904, ten years after the operation, when examination showed some swelling of the sternum and the supraclavicular glands of the opposite (left) side became enlarged. There was no local recurrence. There was dulness on percussion over the sternum and to the left of it, with diminished breathing over most of the left lung. She had a dry cough, resembling the reflex cough of thoracic aneurism. Three weeks later, in a violent fit of coughing she suddenly lost part of the field of vision in the right eye and Dr E J O'Shaugnessy, of New Canaan, wrote that an examination of the eyes revealed a tumor in the fundus. She died in April or May, 1904.

CASE III—Minerva K, forty-three years of age, married, born in New York. Carcinoma of the left breast, removal with the axillary contents at the General Memorial Hospital, April 11, 1895. She remained well until March 14, 1901, when she complained of dyspnoea and cough and pain in the scar, which remained healthy. Nothing could be found of an abnormal character in the examination of the chest. The symptoms gradually grew worse, and when examined November 30, 1903, marked physical signs of internal thoracic deposit were discovered. There was also great enlargement of the sternum. There was no local recurrence. She has not been seen since, and has probably died.

CASE IV—Mary A B, sixty-five years of age, married, born in New York. Carcinoma of the left breast, several nodules following a chronic mastitis. Breast and axillary contents removed at the General Memorial Hospital March 21, 1896. I saw her October 18, 1899. She had hematuria and the left kidney was enlarged. The scar was healthy. March 8, 1901, Dr G A Crump wrote that she still had hematuria, and that there was a growth in the vagina which felt like colloid material and bled readily. The breast scar remained free from recurrence. She died soon afterwards.

CASE V—Harriet E K, forty-nine years of age, married, born in New Jersey. Carcinoma of the right breast, glands small but extensively involved. Breast and axillary contents removed at the General Memorial Hospital, April 27, 1896. In August, 1899, I examined her and found no local recurrence. She had some vague nerve symptoms which I ascribed to hysteria and morphine addiction, as both conditions were present. Soon

after, paralysis slowly developed, with curvature of the spine and severe neuralgic pains. She died in March, 1901, and Dr J Arthur Booth, who had charge of her towards the end and made the autopsy, kindly informed me that he found carcinoma of the vertebræ and some nodules also in the spleen.

I could add to these some cases of tumors in other situations, such as a pylorectomy for carcinoma remaining well until a tumor of the iliac bone developed five years later, and a sarcoma of the foot treated by local excision, without local return, but the patient died of pulmonary sarcoma in three years. But in order to make the material homogeneous I have limited the cases to those associated with tumor of the breast.

I have made no search in the literature for similar cases, as I believe that the cases there are as yet too isolated to be of much value, but the following were at hand and may be mentioned.

Poulsen (*Arch f kl Chir* xlii S 616,) reported three cases of amputation of the breast with late metastases, the patients dying from five to eight years after the operation. Schmidt (*Deuts Zeitschr f Chir* xxvi S 139), recorded a case of death from metastasis in lungs and liver seven years after removal of the breast. Clairmont (*Arch f kl Chir*, 1904, lxxiii S 620) reported a case of late metastasis in the bronchial glands ten years after a nephrectomy for adrenal tumor. König (*Verh Deutsche chirurg Congress*, 1903, S 72) mentioned two cases of late secondary in the neck, ten and thirteen years after removal of the breast. Lomer (*Zeitschr f Geb & Gyn* Bd 50, S 358) quoted from Lubarsch (personal communication) an autopsy on a woman who died of pneumonia, whose left breast had been amputated five years before, microscopic examination of the axillary glands on the left side showing carcinomatous nodules present in them, but the cells showed no mitoses. Petersen (*Beitr z kl Chir* 1904, xlii S 171) quoted a case of von Beck in which a patient died of intestinal obstruction three years after a pylorectomy, and a small carcinoma was found in the sigmoid flexure and also a nodule of carcinoma in the center of a small uterine fibroid.

There had been no recurrence in the stomach Labhardt (*Beitr z kl Chir*, xxxiii S 571) collected several cases, of which two can be added to our list, death from metastasis in the liver five years after removal of breast (von Meyer), and in the lung ten years after a similar operation (Jones and Platt) `

Two hypotheses suggest themselves by which to explain these peculiar cases We may suppose that these late-developing tumors are independent growths, an hypothesis which will account for some cases very readily, especially when the secondary tumor lies in an organ commonly attacked by primary carcinoma, such cases as involvement of the other breast after one has been removed, or of cancer of the stomach or uterus following cancer of the breast But the numerous cases with involvement of lungs and liver, organs in which primary carcinoma is rare, do not admit of this explanation Secondly, we may suppose that the cells from which the secondary tumors spring may have been deposited before the removal of the primary tumor, but have lain latent or developed so slowly that they do not become clinically evident for many years Opposed as this theory is to our preconceived ideas of the growth of carcinoma, and especially of the tumors secondary to carcinoma of the breast, there is considerable pathological evidence of its probability When a late local recurrence also takes place we have clear proof that some cells left by the operation have lain latent, and these are not so uncommon, but in our cases there was no local return

Such authorities as W Petersen (*loc cit*), Lubarsch (*Zur Lehre v d Geschwulsten u Infektionskrankheiten*), M B Schmidt (*Die Verbreitungswege der Karzinome u s w*, Fischer, Jena, 1903), Lomer (*loc cit*), Fraenkel (*Wien kl Wch* 1898, S 465) and Schuchardt (*Centr f Gynec* 1901 S 664) argue that in most cases of carcinoma the actual metastases are much more frequent than supposed, and that probably few primary operations really eradicate all the disease, yet an apparent cure may be obtained lasting for many years The carcinomatous deposits left behind remain latent

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\*See also Schroeder, *Beitr, z kl Chir* xlv S 685-6, Falle 6, 7, 9, 10, 12, 13

and may even undergo retrogressive changes as in Schuchardt's case, in which peritoneal nodules with ascites were found when a carcinoma of the pylorus was removed, yet on autopsy after death from pleurisy over two years later, not only was there no recurrence in the stomach, but the peritoneal nodules had entirely disappeared. We know well how the tissues and cells resist various bacterial infections by phagocytosis, by encapsulation with fibrous tissue, or by direct action of antitoxines upon the bacteria. It is not impossible to imagine that the carcinoma cells could be attacked by the same means, and we can even form the hypothesis that a thorough removal of the primary tumor may not only get rid of the local disease, but may have a beneficial effect upon the resistance of the tissues to the secondary deposits. So much is now appearing with regard to cytolytic ferments and their actions that it seems quite within the bounds of probability to suppose that the large mass of cells in the primary tumor may keep in circulation some chemical bodies which unfavorably affect the resistance of the tissues, and that the removal of this factory of toxic substances might restore the normal resisting power, and enable the tissues to destroy or encapsulate small deposits of cancer cells.

It might be well to note the bearing of these facts and theories upon the usefulness of the operative treatment of cancer. While the cases related detract somewhat from the brightness of the prospects for a radical cure by operation, the number of persons who suffer from these late appearing metastases is not large in comparison with the number of persons who remain free from local recurrences after successful removal of tumors. Even in these cases the interval of freedom is in itself enough to prove the practical usefulness of the primary operation, especially if it approximate ten years. A free interval of ten years at the time of life when the majority of the operations for cancer are performed affords a practical cure, for many of the patients will die of other causes before the disease returns or develops. It cannot be argued that if we cannot remove the disease entirely there is no use in the operation, neither can it be said that operations should be less extensive leaving the

remainder to be dealt with by the resistance of the tissues. Practical experience is against both of these assertions, for the results have improved with the enlargement of the scope of operation. We may even claim that the facts are encouraging, because formerly we had supposed that immediate and prompt recurrence was to be expected when we left behind even the smallest portions of disease, whereas in the light of this evidence we can hope that minute cancerous deposits can be checked in growth or annihilated. Further, if our theory is correct, the removal of the primary tumor assists in this result. Similar effects are seen in the operations for removal of foci of tuberculous disease, for here, too, the results improve with the extension of the operations, and it is well known that the individual is assisted in his combat against a more or less general infection by being relieved of the principal mass of infected tissues.

# CARDIO-SPASM<sup>1</sup>

WITH REPORT OF AN OPERATIVE CASE

BY JOHN F ERDMANN, M D,

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TWENTY months have elapsed since the operation in this case, having felt that a sufficient amount of time should be given to demonstrate a cure before reporting it in detail as a cure

The patient, a female, thirty-three years of age, called upon me on the 7th day of September, 1903, and gave the following history. There was no family history of any note whatever that might in the least have any bearing upon her condition. She has been married four years, never had any children, and has had no occasion to be of a nervous temperament, although she had taught school for a number of years previous to her marriage.

Three years ago, had noticed a peculiar swallowing rattle, as she expressed it, in the throat, which in four or six weeks was followed by difficulty in swallowing foods and cold drinks, giving her an impression of pressure back of the lower portion of her sternum. All things seemed to go down the wrong way. At times she could apparently swallow substances to amount to a small slice of bread. There was invariably, after a short period, vomiting of the material swallowed, varying in extent from the entire quantity to about two-thirds of that swallowed.

From September to Christmas of 1902, she gradually lost weight, weighing during the holidays one hundred and twenty-five pounds, as compared to one hundred and eighty pounds in September—a loss of fifty-five pounds in three months. She now, September 1903, weighs one hundred and forty-four pounds.

She further states that she is positive from her sensations that the materials swallowed all collect or lodge above her stomach, and in the region of her pain, and that her pain is of a boring

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<sup>1</sup> Read before the New York Surgical Society, November 22, 1905

character, travels up to her throat, and is somewhat increased during her menstrual periods. That lying down does not cause the ingested stuffs to flow out, but that she is more prone to backache when occupying this position. A small amount of mucus also is vomited each time. That she has gained the nineteen pounds in weight,—the difference between the Christmas weight of one hundred and twenty-five pounds and that of to-day, September seventh,—by the use of the stomach tube which some one of her physicians had recommended. She states that during the entire winter of 1902, large sized dilators and a stomach tube had been employed. Early in the history of her trouble hot drinks would relieve her pain, but at the present time are entirely inefficacious.

*Examination*—The patient is a female of large build, and rather poorly nourished, although she says her general health is good. Her skin and muscles are flabby. Abdominal palpation reveals no visceral enlargement. Lungs and heart negative.

Upon examining the œsophagus, No 40F enters readily until within the vicinity of the cardia, No 26F and No 20F also are checked at the same distance, while No 16F passed, but was gripped slightly. Successive sizes were then passed up to No 26F, a rest for twenty-four hours was advised, and bland, semi-solid food ordered. She returned on the following day, September 8, and owing to some soreness, No 28F only was passed. On September 9, she reports having swallowed some bread and a bit of beefsteak, without the use of the stomach tube. Bougies up to No 36F readily passed.

September 11 reports that she has been taking solids, but that she has a distinct sense of fullness at the usual site, before a satisfying quantity of food has been taken. To-day for the first time, complains of a lump or ball gripping her in the throat, pointing at this time to the larynx, No 36F passed. Patient wished to return to her home, so I instructed her to pass a large bougie herself, and No 40F was supplied her.

She did not report in person again until January 5, 1904, although by letter she stated that she was able to swallow fairly well, but still had her daily pressure and "fullness" sensations, and that she still vomits.

At this time, January 5, 1904, she is somewhat heavier than



in September, 1903, and says that she has been taking bread and finely chewed meats, but still has her sternum pressure No 40F bougie does not pass, No 36F passed with slight difficulty

During the period dating from September 9, 1903, to January 5, 1904, I was inclined to feel that a fair element of hysteria had more or less to do with the spasmodic condition, and had her placed upon bromides and valerianates, basing my reasons for such medication upon her statements of increase in trouble at the time of her menstrual periods, and also upon the ball and gripping (*globus hystericus*) sensation in her laryngeal region

She (January 5, 1904) now comes to me telling me that the diagnosis of œsophageal diverticulum has again been made, and desires me to again make a careful examination I was satisfied that her lesion was at the cardia, because no deflection or check occurred to the bougie in any portion of the upper four-fifths of the œsophagus For further satisfaction to the patient, and to eliminate any stomach lesion that might, by reflex, influence the cardia, I recommended her to Dr George Roe Lockwood, who advised her to remain under his observation for a few days

She returned home, and on January 11, was admitted in the Private Hospital Association under Dr Lockwood's care

10 A M —Tube passed and fed, unable to hold half-pint

1 P M —About fourteen ounces of fluid taken without the tube

5 P M —Dr Lockwood passed the tube, and withdrew one pint of sour smelling liquid

From this date on, until January 27 with few exceptions the patient was fed by the tube, and occasionally by the rectum A bougie was passed of largest size almost daily, and the stomach tube passed and allowed to remain for a period of thirty minutes During this period there would be frequent expulsions or siphonages of various types of colored fluids, and of pap to fluid consistency, varying in quantity from a few ounces to several pints Passing the bougie was easily accomplished one day, and the next an absolute obstruction would be met with, while the stomach tube rarely encountered any obstruction

January 27th the patient weighs one hundred and thirty pounds, being a loss of fourteen pounds in a month

Dr Lockwood was satisfied that all mechanical and medicinal



FIG 1—Cardio-spasm



FIG 2—Cardio spasm

means had been given a fair trial, and suggested the Mikulicz operation, and to this I more than agreed

The patient gladly grasped at some means of cure, and accepted the treatment, requesting the privilege of a visit to her home before submitting

She returned, and came under my care in the same institution on March 6, 1904, was given calomel, and several hours later, the stomach was washed out with two pints of salt solution. The latter was repeated at noon of the day of the operation

*Operation, March 7, 1904*—Median epigastric incision about five inches long. Stomach easily exposed, was found lying in an absolutely transverse position, and contracted so that it was less in diameter than the large intestine. An incision was made in the long axis of the stomach, sufficient to admit the hand, in this instance about four inches long (See Fig 1)

The cardia readily located, but impossible to introduce a finger. Dr Lockwood, at my suggestion, passed an œsophageal bougie, and while holding my finger in the neighborhood of the cardia, I could feel, through the stomach's lesser curvature, the bougie passing down toward the right, then sweep over to the left, describing a distinct sickle curve, then the point entered the cardia, and passed into the stomach. The bougie was then gradually withdrawn, and followed by my index finger. After this it was an easy matter to introduce the second finger, and proceed with the dilatation (Fig 1). The impression gained by visual observation of the stomach, and palpation of the walls of the œsophagus, is schematically represented by Fig 2

After the second finger, a third was introduced, stretching the non-resisting cardia fully four to six cm as suggested by Mikulicz. While the two fingers were in the œsophagus, up to the metacarpo-phalangeal junction, I struck by the absence of contact with the walls. Separating the fingers as widely as possible, I was just able to come in contact with the lateral surfaces. After completely outlining the walls by palpation, the impression of size and shape were given as shown in the illustration

The pouch was located chiefly to the right of the spinal column, the vertebræ being readily outlined through the posterior wall. The opening in the stomach was closed by three rows of

sutures, the first and second being continuous chain stitch, and the third (Lembert)

Nothing of any note occurred after the operation, except bloody vomiting for twenty-four hours, and that on the ninth post-operative day a small sinus developed in the wound, which closed in three or four days. On the afternoon of the 8th of March a small quantity of water was allowed by mouth, nourishment entirely by rectum. Liquid nourishment was given by the mouth in small quantities on the third day, a raw egg on the fifth day, and on the seventh post-operative day she was given soft-boiled egg and bread, baked potato and gravy at different times.

From this time on nourishment of the more solid variety was given, and rectal alimentation was discontinued on the ninth day. The patient was discharged on the twenty-first day.

Numbers of grateful letters have been received from the patient, all containing the satisfactory news of increase in weight, and that no more of the former symptoms exist whatever.

At the close of the first year, she wrote that a gain of 35 pounds had been noted in her weight. About two months ago, she called upon Dr. Lockwood and myself, and stated that she was still a cured case, and had added a few more pounds to her weight of April second.

Mikulicz, in the "Deutsche Medicinische Wochenschrift," of January and February, 1904, has contributed quite an extensive article titled, "Zur Pathologie und Therapie der Cardio Spasmus," and reports four cases, two over one and a half years, and two about nine months post-operative duration, in which he calls attention to the differential diagnosis of these cases from carcinoma, diverticulum and stenosis, and dismisses the questions by citing but two of the symptoms and signs of this disease, both of which were well marked in this case. First the pear, or flask-shaped dilatation, invading the lower one third to two-thirds, which may be of such dimensions as to contain from a few ounces to two pints and over, and that owing to the spasm at the cardia the neck of the flask or small end of the pear-shaped dilatation is always upward (see illustration). The contents of this dilatation can be siphoned off, irrespective of those of the stomach, etc.

Second, the dysphagia of cardial type, well expressed in the history of my case, and attributable to the retained contents producing an erosion, or œsophagitis accompanied with erosions

Under the question of ætiology, numbers of causes are given in his article, among them being (I), primary cardio spasm (Mikulicz and Meltzer), (II), primary atony of the musculature of the œsophagus (Rosenstein), (III), synchronous paralysis of the circular œsophageal fibres, with spasm of the cardia due to a vagus involvement (Klaus), (IV), congenital, (Fleiner), (V), primary œsophagitis, (Martin)

The operation performed by me in this case was after the method of Mikulicz, as briefly but very indefinitely described in the above journal

Treatment in these cases at this date resolves itself more into a mechanical than an operative treatment, with the latter as a final resort when instrumentation fails

Mikulicz' idea in manual divulsion of the cardia was to produce a similar effect to that found in stretching any sphincter to a point productive of paralysis. Whether he felt that by producing such paralysis and allowing of constant emptying, the muscle would return I do not know, but personally I feel that this effect should and could be obtained by this means

That this paralysing effect is possible with properly constructed instruments, must be admitted, and recently H. Straus reports in the "*Kleinsche Woch.*" No 49, 1904, one case of a male 30 years of age, with a history of ten years' duration, cured or markedly improved by the use of a stomach tube, to the distal end (above the eye) of which an inflatable rubber bag is attached, in such manner as to appear that the tube had passed through the bag's or balloon's centre. To the side of the stomach tube, a very small-calibred rubber tube is attached, that connects with the inflatable bag. This tube terminates proximally in a mouth piece through which air is blown. A safeguard in the shape of a mercurial pressure, regulating apparatus is used

This instrument is introduced so that the bag when in the stomach is in a deflated condition, then air is blown in until the mercurial gauge showed pressure equal to complete

inflation Air is then let out so as to partially deflate the bag, and then the tube withdrawn sufficiently to engage the distended bag in the cardia, and eventually pull it through Numerous sittings are given

Dr. Lockwood has devised an ingenious instrument, on the Kohlman urethral dilator pattern, but has discarded it owing to its proving unsatisfactory The same in a certain sense must be admitted of all instruments devised for this purpose, for the following reasons Danger of rupture of the tissues by an instrument that cannot give the accurate impression of resistance that is given to the finger, inability to properly perceive the proper location by these devices, and thereby needlessly cause unnecessary discomfort, that in the rubber-bag variety, if the cardia is rather resisting, the air being driven downward, one of two things will occur either the bag will rupture into the stomach, a matter of no consequence, or by forcible pulling, the air bag will flatten out and may produce serious visceral lacerations

In conclusion I would suggest the following

The use of some apparatus allied to Kraus', but with little force used in its extraction Should several sittings not be followed by evidence of improvement and cure, that the operation of gastrostomy, with manual dilatation, as detailed above, should be done

# THE TREATMENT OF DIFFUSE SEPTIC PERITONITIS<sup>1</sup>

BY ROBERT G LE CONTE, M D,

OF PHILADELPHIA

WHILE in Chicago a month ago I was astonished to hear Murphy say that in his last 29 cases of diffuse peritonitis he had had but one death, and the purpose of my remarks this evening is to recount his technique in these cases and bring the subject before you for discussion. The majority of us, I think, have been in the habit of douching the peritoneum with large quantities of sterile salt solution, with or without partial evisceration, where the infection was diffuse. This has been our practice at the Pennsylvania Hospital, and our mortality is probably between 70 and 80 per cent, for we receive many cases in the last stages of septic peritonitis, where operation is undertaken as the only chance in an otherwise hopeless condition. If more than 20 or 30 per cent of such cases recovered, we fancied our technique was rather superior.

While the procedures of Murphy do not present anything particularly new, he has assembled in his technique all of the good things to do and has eliminated the unnecessary or harmful ones. His principles, from a theoretical standpoint, will appeal to everyone, and in practice the theory is sustained by the excellent results obtained. The essentials of his technique may perhaps best be stated under six headings.

1 The rapid elimination of the cause of the peritonitis, whether it be a perforation of the bowel, a gangrenous appendix, a ruptured pus tube, etc. This must be done with the least possible handling of the peritoneal contents.

2 Drainage by tube of the lowest portion of the pelvis through a suprapubic opening, and free drainage through the operative incision.

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<sup>1</sup> Read before the Philadelphia Academy of Surgery, November 6, 1905



3 The elimination of all time-consuming procedures at the time of operation

4 The semi-sitting position of the patient after operation, the so-called Fowler posture

5 The absorption of large quantities of water through the rectum, which reverses the current in the lymphatics of the peritoneum, making the surface of that membrane a secreting instead of an absorbing one, and also markedly increasing the secretion of urine

6 The prevention of peristaltic movements of the intestines by withholding all food or liquids by mouth, and perhaps by the administration of opium

You will notice that none of these essentials is absolutely new, for all of us have practiced one or more of them at different times on different patients. But while doing some of them we have omitted others and at the same time perhaps have done things that were unnecessary and harmful to the patient. Let me elaborate these points a little more fully.

First In removing the cause of the peritonitis the less the peritoneal surfaces are handled the better, for nature has thrown out protecting lymph which inhibits the absorption of toxic substances and in handling such surfaces there is danger of bruising and rubbing off the lymph, opening up a new avenue for absorption and infection. Therefore Murphy believes that no attempt should be made to sponge the peritoneal surfaces or to wipe off any lymph that may be found, as such manipulation would increase the danger of septic absorption.

Second When the patient is placed in the Fowler position the fluids in the peritoneal cavity will tend to gravitate towards the pelvis, and in addition the action of the diaphragm during respiration will help to pump the fluids in that direction, making drainage of the lowest part of the pelvis with a tube very important. If there is sufficient fluid in the pelvis to fill the tube, each excursion of the diaphragm will pump a certain amount of it out, which will be absorbed in the dressing. It must be remembered that it is not the quantity of fluid present which is harmful, but rather the extent of the peritoneal

surface which comes in contact with it, so that a quart of pus contained in a round cavity would be less dangerous than an ounce thinly coating over the peritoneal surface

Third It is well known that patients with diffuse septic peritonitis stand a short operation well but a prolonged one badly, therefore, when all one's energy is directed to at once removing the cause of the peritonitis, and all other procedures except drainage eliminated, an operation can be speedily completed, on an average, perhaps in six or eight minutes This naturally permits of a minimum amount of anæsthetic, thereby directly decreasing the chances of shock and vomiting after operation

Fourth The advantages of the Fowler position are so well recognized now that it only needs to be mentioned

Fifth Murphy's method of introducing large quantities of water into the rectum is novel He inserts a nozzle containing three or four openings into the anus to which is attached a rubber tube leading to a bag This bag is filled with water and elevated but a few inches above the plane of the rectum, the idea being that the water shall just trickle into the rectum not much faster than absorption takes place In this way from a pint to a quart of water should be allowed to trickle in during an hour, the process being a continuous one and the flow so regulated that no accumulation of fluid takes place in the bowel In other words, an attempt is made to run the water in as fast as it is absorbed The object of having more than one outlet in the nozzle is that in case flatus accumulates in the rectum it will pass out through one of the openings in the tube while the others continue to discharge the water into the rectum When it is desirable to stop the flow of water the tube is disconnected from the nozzle, the latter remaining in the anus, thereby avoiding irritation to the anus by the constant removal and insertion of the nozzle and at the same time facilitating the passage of flatus

By this method large quantities of water will be absorbed within the first few hours after operation This absorption does two things First, It reverses the current of lymph in the peritoneal lymphatics so that instead of absorption taking place from the peritoneal surface the mouths of the lymphatics pour

out fluid, bathing the peritoneum with this free discharge. The posture, together with the action of the diaphragm, constantly sends this fluid downward to the pelvis, washing away the infectious material from the peritoneum in its descent, and escaping from the pelvis through the drainage tube. Second, The free absorption of the fluid from the rectum stimulates the heart and kidneys, and largely increases the amount of urine passed, eliminating through this channel the septic material which has gained entrance to the circulation. After the ordinary abdominal section in a non-septic case the average amount of urine secreted in the first twenty-four hours is perhaps 15 ounces, and in the presence of sepsis it is apt to be even less. In the first case that I shall report this evening more than 60 ounces of urine was secreted in the first twenty-six hours.

Sixth. Stopping all food and liquid by mouth will check peristalsis and prevent the dissemination of septic material by peristaltic movements. The absorption of large quantities of fluid by rectum is quite sufficient to sustain the patient for forty-eight hours or more, but if the condition of the patient is so precarious that food seems a necessity, small quantities of it can be run into the rectum with the water.

As an example of the results obtained by this method let me relate briefly the histories of two cases, one representing the fulminating type of perforating appendicitis in which perforation takes place within a few hours after the onset of the first symptom, without protecting abdominal adhesions, the other a case of walled-off appendiceal abscess in which the abscess had ruptured into the general peritoneal cavity, where no adhesions were present.

CASE I—A small, pale, thin married woman, aged 26, was admitted to the Bryn Mawr Hospital at 11 A.M., October 11, while in her third attack of appendicitis. The attack began the previous day at 8 P.M., with sharp abdominal pain, which gradually became agonizing, but which was suddenly much relieved at 4 A.M., the estimated hour of perforation of the appendix.

On admission the temperature was 100.2-5, pulse 112. An hour and a half after admission an incision was made through

the right rectus, and immediately on opening the peritoneum there was an escape of a considerable amount of purulent fluid with shreds of lymph floating in it. The appendix was ruptured, partially gangrenous and bound down at its base by rather old adhesions, but the remainder was without adhesion to the surrounding viscera. There was a general diffuse peritonitis, (no attempt at walling off), with occasional patches of lymph coating the intestines, while the head of the cæcum was much inflamed, intensely red and the peritoneum had lost its glistening character. The appendix was removed, a puncture made through the abdominal wall in the median line two inches above the pubis for the admission of a drainage tube which led to the bottom of the pelvis. Another drainage tube was inserted through the operative wound leading to the right iliac fossa, while the remainder of the incision was filled with loose gauze. No sutures were used. The duration of the operation was six or seven minutes.

The patient was placed in bed in the Fowler position and the rectal enema at once begun. During the first twenty-four hours the patient received  $12\frac{1}{2}$  pints of salt solution through the rectum, not more than 6 or 8 ounces of which was expelled. The temperature ranged from 98 to  $99\frac{3}{5}$ , and the pulse came down to the 80's. She had a fairly comfortable night after  $\frac{1}{6}$  gr of morphia had been given hypodermically. During the first twenty-four hours the abdominal dressings had to be changed twice owing to their complete saturation with a colorless fluid of a slightly sour odor, and in the first twenty-six hours 65 ounces of urine were passed. On the third day a little water was given by the mouth for the first time, and from then on the fluids were rapidly increased. The rectal enemas were stopped at this time. No purgatives were given and on the fifth day the bowels moved twice naturally. The remainder of the convalescence was uneventful, the temperature and pulse remaining normal.

CASE II—An Italian aged 37 was admitted to the Bryn Mawr Hospital October 14, having been sick five days. The attack started with severe general abdominal pain and nausea. The pain shortly localized itself in the appendix region, and previous to admission he had two chills, with fever and sweats.

On admission temperature was  $102\frac{3}{5}$ , pulse 120, respirations rapid, tongue dry, general appearance of typhoid condition

The abdomen was opened through the right rectus and an appendiceal abscess was found, which had ruptured into the general peritoneal cavity, the pus welling up through the incision with each respiration. A gangrenous, perforated appendix was removed, and the drains arranged as in the previous case without sponging the peritoneum or even removing the excess of pus which was flowing from the wound. The operation lasted about seven minutes. While on the operating table his pulse was recorded at 200.

During the first ten hours 9 pints of salt solution were given by rectum, about a pint of which was not retained. Temperature dropped to  $98\frac{4}{5}$  and the pulse varied from 100 to 80. He passed 900 c c of urine during the first thirty hours. As in the previous case nothing was given by mouth until the third day, when water was begun and the fluids rapidly increased. On the third day, without purgatives, the bowels moved twice. The rest of the convalescence was uneventful.

These two patients recovered without a single untoward or alarming symptom. The rapid falling of the temperature and pulse to normal, the absence of further septic absorption, the free elimination through the kidneys of toxic material, the absence of distention, nausea and vomiting, etc., lead me to believe that the favorable termination was directly due to the method practised.

## EXTROVERSION OF THE BLADDER

RELIEF BY TRANSPLANTATION OF THE BLADDER INTO THE  
RECTUM

BY B G A MOYNIHAN,  
OF LEEDS, ENG

IN cases of extroversion of the bladder, no operation met with any noteworthy success until the work of Petersen had shown that by preserving the valvular termination of the ureter in the bladder, the transference of the ureters into the intestine was capable of being successfully accomplished. The most satisfactory application of this knowledge was made by Peters of Montreal. The old plastic operations of Wood and Ayres made the patients possibly a little more comfortable, but did nothing to relieve a condition which they, as well as their neighbors, felt to be revolting.

On March 11th, 1905, I was asked by Dr Empey, of Cross-hills, Keighley, to see a youth, J B, aged nineteen, who fifteen years before had had a plastic operation performed for extroversion of the bladder. Flaps from the lateral aspects of the abdominal wall had been turned over to the middle line until a sort of bridge had been formed over the upper part of the exposed mucous surface. The lower part of the bladder mucosa, however, that which bore the ureters, was still exposed, and urine therefore escaped on to the surface of the abdomen. It was there caught in the usual rubber receptacle, of pestilential odour, and drained downwards to the leg. The patient, with increasing years had become more painfully aware of the misery of his condition and begged to have something, anything done to relieve him of his terrible affliction.

On examining him I realized at once that the upper part of the bladder mucosa was healthy, that it might be preserved. I therefore decided not to transplant his ureters, but to transplant

his whole bladder, or so much of it as the operation might show to be vascular enough to transplant, into his rectum. It occurred to me that if a large area of the bladder could be grafted, so to speak, into the rectum, that the capacity of the bowel would be increased, and a veritable cloaca formed. My only doubt was that the vascular supply furnished along the ureters might be insufficient for a large area of the bladder. But in the operation I now describe I found that, when the edges of the bladder were trimmed with scissors, a free oozing of blood occurred from the cut surface. I therefore was able to transplant the entire bladder. The following are the details of the operation.

*Operation*—The ureters were first catheterised (Fig 1). Owing to the previous constant friction against the exposed bladder mucosa, which pouted exuberantly, this little manœuvre was by no means easy. A catheter was passed for 4 inches into each ureter and was fixed there by a single stitch which caught up the tube on one side and the bladder on the other. A vertical median incision was then made from the exposed bladder mucosa towards the umbilicus, the flaps which had been turned over to the middle line in the previous operations being completely cut through. On turning aside the flaps thus made the upper, previously covered, mucous surface of the bladder was exposed, it was found to be smooth, thin and entirely different in character and appearance from that of the lower exposed part. An incision all round the margin of the mucous membrane of the bladder was now made, between the mucosa and the skin, and the incision was deepened by degrees until a good thickness of the bladder could be raised up. The dissection from the margin of the bladder towards the ureters was continued, round the whole circumference, little by little. This was difficult in part owing to the fact that there was much scar tissue left from the former operations, in part because the great vascularity demanded frequent cessation to restrain the hæmorrhage by pressure. The separation above the pubes was most difficult, and here the prostate had to be separated with great care.

The purpose of this process of separation was to isolate the whole of the bladder, leaving only as its pedicle, so to speak, the two ureters. As much tissue was left round each ureter as possible, so as to avoid the possibility of damage either to the

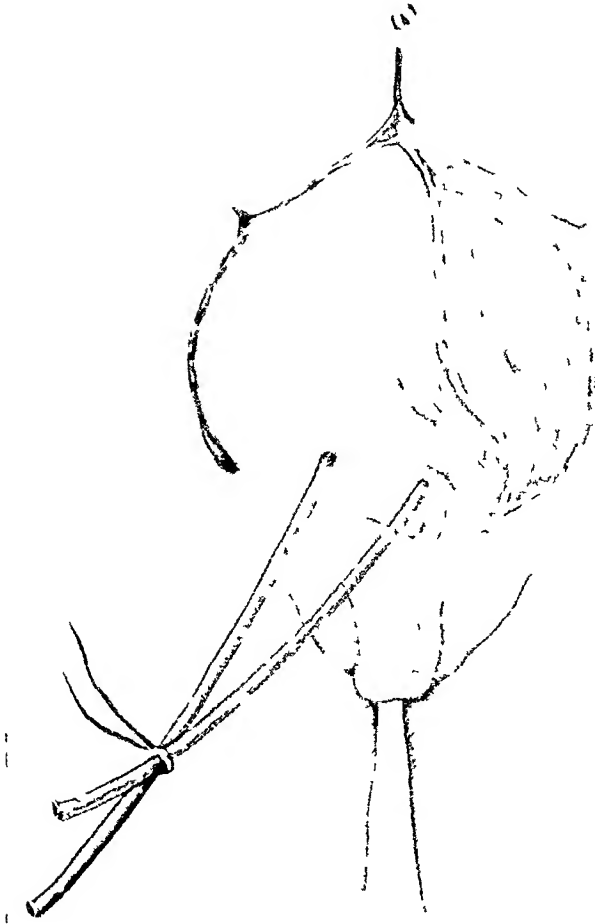


FIG. 1—Catheterisation of the Ureters The Scars of the former flap operations are visible



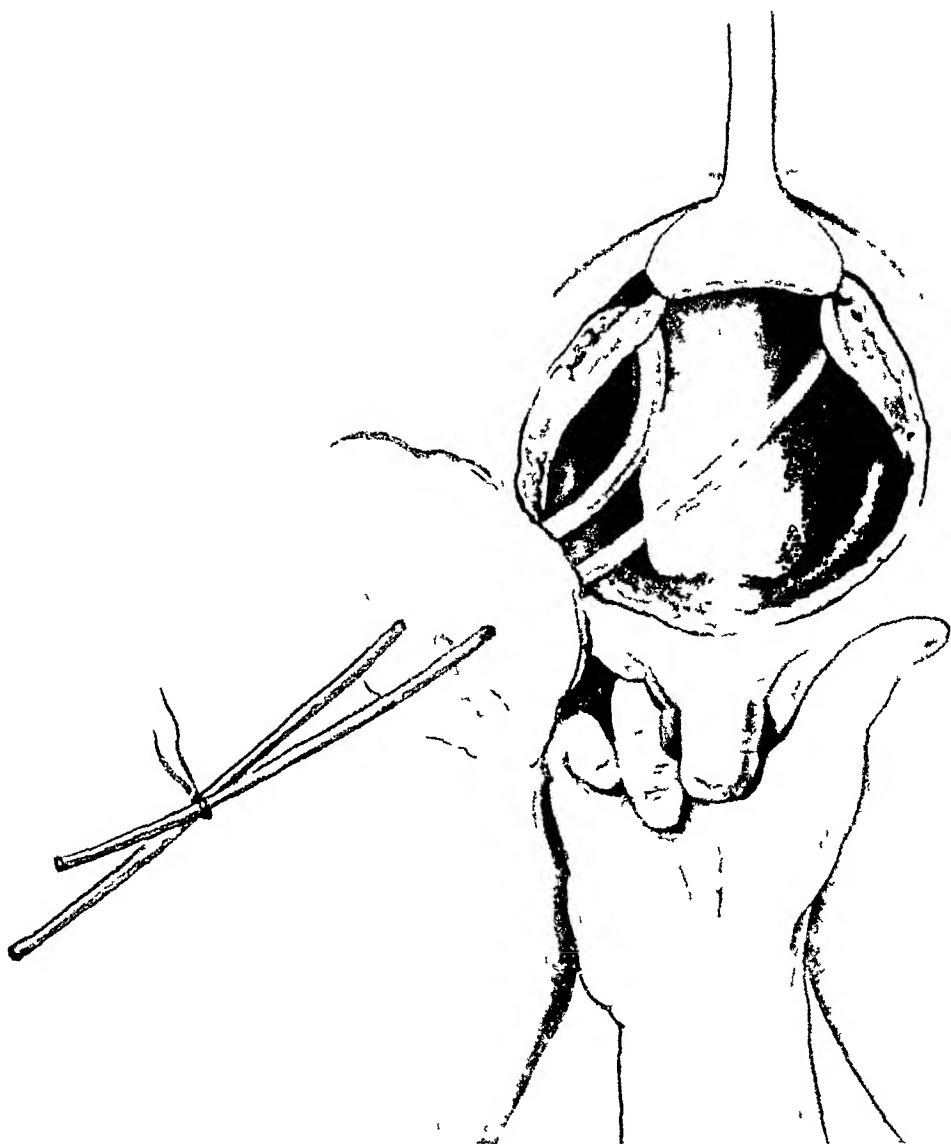


FIG. 2.—The Bladder Separated (in the actual operation, the ureters were not stripped so much as in the figure)

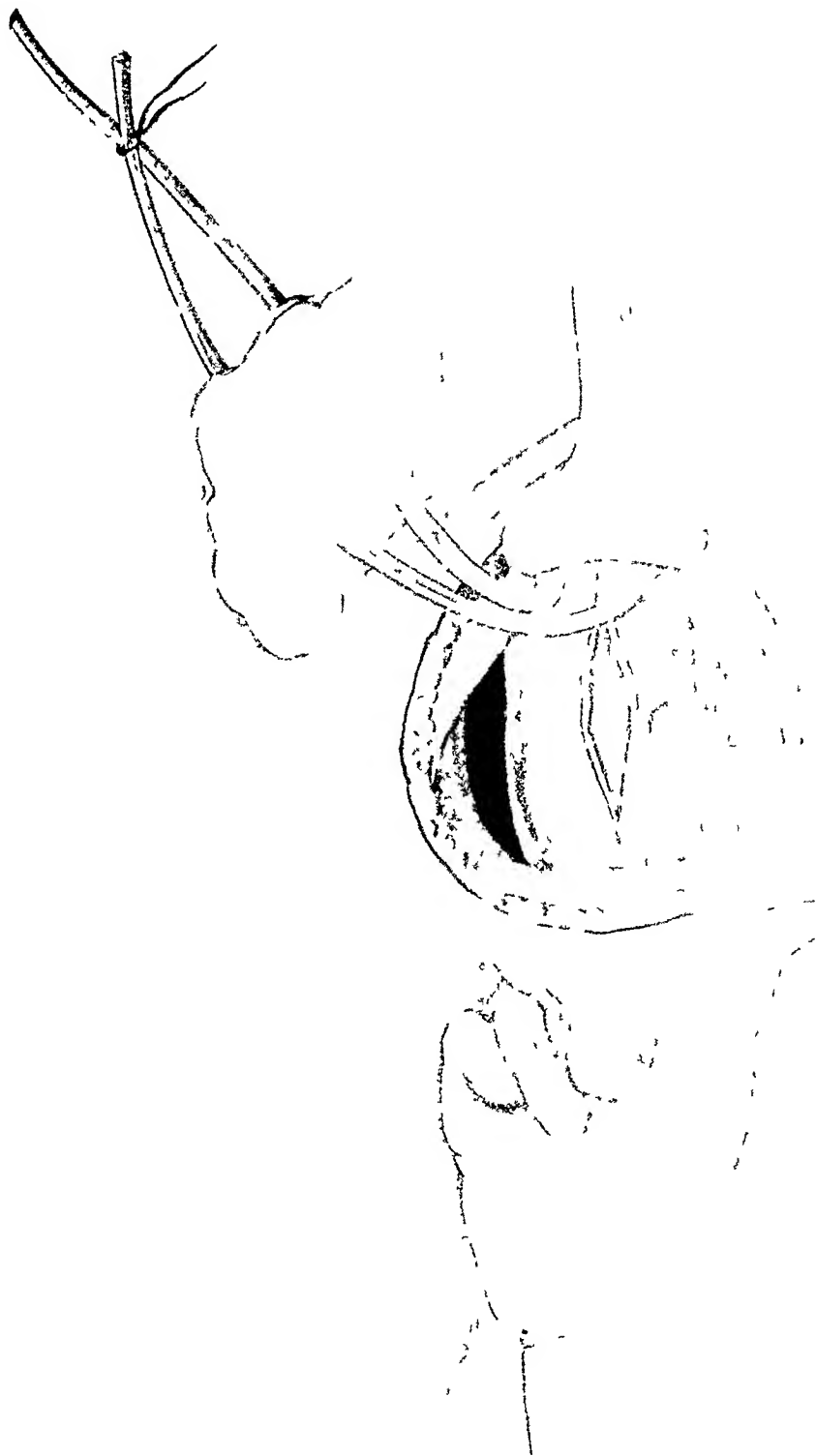


FIG 3—Inc. return opened ready for the transplantation of the bladder

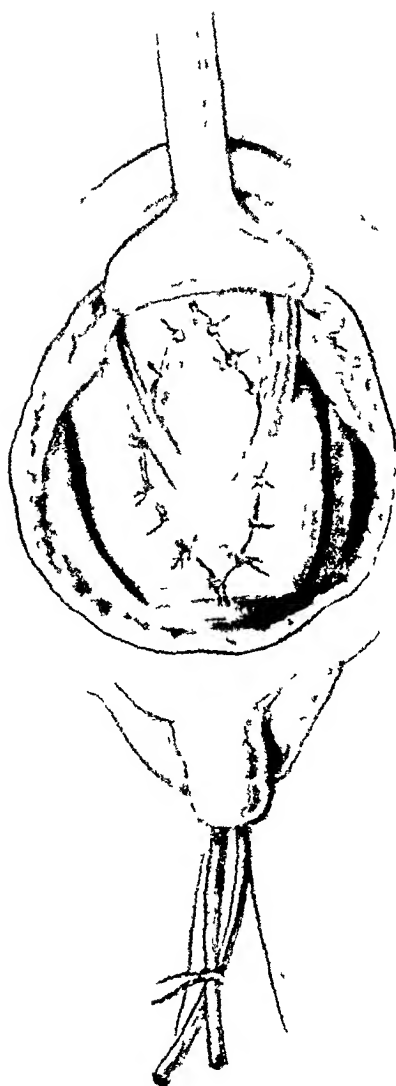


FIG. 4 — The transplantation completed

ureter itself or to its vessels In the annexed diagram (Fig 2) the ureters are shown clearly defined This was not their condition during the operation, the figure is so drawn only for the purpose of making the details of the operation clear As soon as the bladder was well isolated it was drawn upwards towards the umbilicus and there held by an assistant In the bottom of the wound the rectum was now seen, and, above, the peritoneal reflection on to it The serous covering was then stripped upwards from the front of the rectum until 4 or 5 inches of the bowel lay exposed at the bottom of the wound In stripping the peritoneum up, a small rent was made into it, which was closed at once by a continuous catgut suture

The finger of an assistant was now passed into the rectum to make it prominent, and along the anterior surface of the bowel an incision about  $3\frac{1}{2}$  inches in length was made (Fig 3) The upper and lower ends of this incision, and the mid-points of the sides were held with small vulsella, until a large opening was made Into this opening the bladder was placed, being turned upside down so that its former anterior surface became posterior, and its former lower end became the upper The ureters instead of passing forward to the bladder passed backward and the catheters passed into the rectum and out at the anus The edge of the bladder and the cut edges of the rectum were now sutured together, by two stitches that were continuous, one taking the right side, and the other the left (Fig 4) The sutures were passed after the manner of Lembert so that no mucous membrane was included in them A few additional interrupted sutures were necessary here and there

When the sutures seemed to be securely uniting the bladder and the rectum, the wound was dried and the skin edges along the original median incision were drawn together At the upper end, the edges came well into apposition but about an inch at the lower part had to be left open The catheters which had been introduced into the ureters now passed out of the anus, the sphincter had previously been stretched The operation lasted an hour and a half

The after progress of the case was satisfactory The catheters remained in the ureters for four days, the urine being collected into a bottle After their removal urine passed into the

rectum and dribbled out at the anus, which, owing to the stretching of the sphincter, as yet exerted no control. On the seventh day, a little urine began to leak by the abdominal wound, and this continued for a week. On the fifteenth day an anæsthetic was again administered, and the leaking point in the former line of suture discovered, and made good. From this day the wound remained absolutely dry, all urine escaped by the rectum and control gradually returned until at the end of a month it was perfect. Urine was then passed by the rectum about every two hours. The interval between the acts of emptying the rectum has gradually increased until now (Nov. 1905) the shortest period is three hours and the longest five hours. The urine is quite sweet and is normal on examination.

When the rectum is now examined the line of junction between the mucous membrane of what was the bladder and the mucous membrane of the rectum cannot be distinguished. All feels smooth and even and continuous. There is a fairly capacious cloaca.

NOTE—The accompanying drawings were kindly made for me by Miss Ethel M. Wright.

## TWO CASES OF RUPTURE OF THE BLADDER

BY JOHN MARNOCH, M B, C M,

OF ABERDEEN,

Surgeon to and Lecturer on Clinical Surgery at the Royal Infirmary of Aberdeen

WITHIN recent years valuable papers have been published on intraperitoneal rupture of the bladder, notably by Alexander and Jones in *THE ANNALS OF SURGERY*, and from a review of the published cases some definite conclusions have been arrived at as regards the mechanism, clinical features and results of treatment of this rare accident. Since MacCormac, in 1886, published the first two cases successfully operated upon quite a number have been put on record and it is now quite clear that the prognosis with the advance of surgical technique is becoming more and more favorable. Thus, Jones in the fifty-four cases collected by him showed that the death-rate was forty-eight per cent but that twenty-two of these fifty-four cases occurred during the last ten years and in them the mortality was only twenty-seven and a half per cent. This is all the more striking a tribute to surgical progress when it is borne in mind that the average time between the accident and the operation was longer in them than in those occurring previous to ten years ago. Two cases of rupture of the bladder have come within my experience and it has been thought desirable to add these to the few recorded since the publication of the papers mentioned above.

*CASE I—Intraperitoneal and Extraperitoneal Rupture of the Bladder—Suture—Recovery—*J M, fifty-two years of age, by occupation a shipwright, was admitted to the Royal Infirmary, Aberdeen, on the 10th March, 1903, with the following history. At 1 P M on the previous day while ascending stairs he fell and struck the lower part of his abdomen on the edge of one of the steps. His complaint was that from the time of his accident he

had had pain over the region of his bladder and inability to pass urine. There was no sign of external bruising but the lower part of the abdomen was somewhat distended especially in the median line and on percussion the whole lower abdomen from about one inch below the umbilicus was dull as also were the flanks. Dr Robertson, my house surgeon, passed a catheter without meeting any obstruction and drew off about three ounces of apparently normal urine, followed by a few drops of blood. As no relief was experienced the patient was once more catheterised, but this time no urine came away at all and as the pain and desire to micturate were still complained of and no difference was to be detected in the percussion dulness already referred to he was put to bed. Catheterisation after a lapse of two hours again brought away about two ounces of urine, followed by some blood. Dr Robertson then resolved to try the injection test, and accordingly 13½ ounces of warm boracic lotion were run into the bladder by catheter, tube and funnel under strict antiseptic precautions and only four ounces could be withdrawn subsequently. Patient's temperature was 98° and his pulse was 96, occasionally slightly irregular but of good volume. He had no appearance of collapse or shock. A diagnosis of intraperitoneal rupture of the bladder was made and I was sent for with a view to operation.

Operation at 1.25 P. M., rather over twenty-four hours after the accident. An incision was made in the median line from the pubes upwards and the prevesical space opened first. From this region some blood-stained urine escaped from a small irregular tear just behind the pubes. Through the peritoneum fluid could be felt in the peritoneal cavity, which was accordingly opened and a large amount of blood-stained liquid escaped. With the exception of slight congestion of the intestines at the lower part of the abdomen there was no trace of peritonitis. The peritoneal cavity was mopped clean and an examination of the bladder instituted, when a small tear was found in the median line just behind the peritoneal reflection. The rupture of the viscus extended from just behind the pubes along the top to a point behind the peritoneal reflection referred to. This rupture had not penetrated the whole thickness of the bladder wall except at its two extremities. The extraperitoneal rupture behind the pubes was with great difficulty surrounded by a purse-string suture which was

then buried by a series of interrupted Lembert sutures. The intraperitoneal rupture was closed by a double row of Lembert sutures without difficulty. The abdominal cavity was thereafter mopped dry and after flushing copiously with sterile salt solution the peritoneum was completely closed as was also the rest of the abdominal wound except at the lower part where tube and gauze drainage leading down to the extraperitoneal rupture was employed. A soft rubber catheter was introduced per urethram into the bladder and tied in.

About 15 ounces of urine were passed by catheter during the rest of the day, but some came by drainage through the lower angle of the abdominal wound. The following day less came by catheter and more suprapubically, as his catheter was frequently found partially withdrawn from the bladder. In the evening his temperature rose to 101°F and the patient began to show signs of delirium tremens. After a very restless night his temperature came down almost to normal and during the following day 35 ounces of urine came by catheter and very little suprapubically. This went on, sometimes a good deal coming by catheter and less the other way and *vice versa*, when it was discovered that the patient had been attempting at intervals to remove the instrument from his bladder from a few hours after the operation and eventually on the fourth day, he succeeded in extracting it altogether and absolutely refused to have it replaced. His restlessness and delirium never became violent and in five or six days disappeared. The subsequent history is that the suprapubic wound gradually closed and in ten days all his urine was passed per urethram. He was discharged well exactly a month after operation.

About this case there are many points of interest, but the chief are. In the first place, the extraperitoneal and intraperitoneal ruptures were not distinct and separate from each other but were simply the extremities of a median rupture in the vault of the bladder which had not in the rest of its course completely penetrated all the coats. Then, again, in dealing with an intraperitoneal wound of the bladder the safest practice after suturing is undoubtedly to pass a drain for a few days down to the neighborhood of the suture, but



here the circumstances were exceptional I felt I could count almost to a certainty on the sutures of the intraperitoneal wound holding, but could not do so in the case of those of the extraperitoneal wound on account of the difficulty I had in getting them placed behind the pubes. Leakage from the latter, had intraperitoneal drainage been employed, would probably have infected the former and ended in disaster. The subsequent behavior of the patient in withdrawing the eye of the catheter from his bladder leading to distention of that viscus and leakage from the suprapubic wound proved the wisdom of the procedure adopted. The absence of peritonitis is noteworthy and once more explodes the old idea that peritonitis is set up as soon as urine escapes into the peritoneal cavity. In this case it was evidently due to the aseptic condition of his urine.

CASE II—*Extraperitoneal Rupture of the Bladder and Hydatid Cyst of the Abdomen—Operation—Recovery*—Mrs M., forty-one years of age, was admitted to the Royal Infirmary, Aberdeen, on the 18th March, 1904, at 11.45 P.M. She stated that at 9 A.M. on the previous day she had fallen a height of ten feet, alighting on the left side of her pelvis and back and that since that time she had had continuous pelvic pain with frequent desire to urinate and the passage of very small quantities of blood-stained urine. She looked flushed and feverish, her temperature being 100°F, pulse of fair quality, 104, and respirations 20. On account of the pelvic pain she was unable to turn on her side. Her abdomen was moderately distended and did not participate in the respiratory movements. There was general tenderness with loss of resonance in the flanks and bladder region and tympanitic note elsewhere, while the liver dulness was completely abolished. Tapping the iliac crests produced slight crepitus and aggravated the pelvic pain. No abnormality could be made out on vaginal and rectal examination. Catheterisation of the bladder brought away eleven ounces of dark blood-stained urine and on trying the injection test the full quantity was recovered. About an hour after admission she vomited some bilious material.

It was evident from the condition of the abdomen that an intraperitoneal injury had occurred, but the exact nature of it I

could not determine While extraperitoneal rupture of the bladder was thought probable, an intraperitoneal rupture, although not absolutely negatived by the injection test, was rendered less likely

Operation 2 A M on the 19th March, forty-one hours after the accident The prevesical space was first explored but no sign of rupture could be made out, and accordingly the peritoneal cavity was opened After mopping out a quantity of blood-stained fluid a careful but fruitless search was instituted for injury to any of the contained viscera The frequency of micturition with the passage of very small quantities of blood-stained urine pointed to a bladder injury, and in case a small intraperitoneal rupture had escaped observation I caused the organ to be distended with warm boracic lotion It was then seen that the rupture was extraperitoneal, the injected fluid coming welling up from behind the pubes, but the site of the injury was so inaccessible that no attempt was made to apply sutures There still remained the difficulty of accounting for the blood-stained fluid in the abdominal cavity so, once more, the viscera were systematically explored and at length a cyst was discovered lying retroperitoneally behind and rather to the outer side of the ascending colon, reaching from the cæcum below to the front of the right kidney above This was enucleated by an incision through the peritoneum to the outer side of the large intestine and was found to be oval in shape, six inches long and three in diameter, with very thin gauzy looking walls and containing a clear limpid fluid No further abnormality could be made out and the abdominal cavity was flushed with sterile salt solution and the wall closed except at its lower angle, where gauze drainage of the prevesical space was established A flexible catheter was passed per urethram into the bladder and the patient sent back to bed

Her subsequent history is that the blood-stained urine soon became clear, while the retropubic urinary fistula gradually closed, convalescence being retarded by the occurrence of some suppuration in the left labium and adjacent adductor region She left the Hospital on the 18th July, 1904, quite well Histological examination of the cyst proved it to be a hydatid The patient was at first too ill to have a skiagram of the pelvic bones taken to show the site of the fracture and unfortunately this was omitted before her dismissal

As in the other case, both an extraperitoneal and intraperitoneal injury occurred as the result of the fall. What the intraperitoneal lesion was is obscure, but a reasonable hypothesis seems to be that there existed in the abdomen another cyst similar to the one discovered, but which had ruptured at the time of the accident, the contained fluid escaping into the peritoneal cavity and setting up irritation with effusion. Assuming that the wall of the ruptured cyst was of the same thin, gauzy nature as the other, it cannot be wondered at that, when collapsed, it escaped detection. The combination of fractures of the pelvis in this case with extraperitoneal rupture of the bladder and the absence of fracture in the intraperitoneal case is in conformity with the general rule

# LOOSE BODIES IN THE KNEE JOINT

WITH REPORT OF CASES

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THE *Corpora Libera Articulorum*, the *Corpora Mobilia*, the *Mues Articulii*, the *Gelenkmaus*, of the Germans, the *Corps Etranger Articulaires*, of the French, and the Loose or Floating Bodies of the English, have been classified into *a*, Those in normal joints, or if the joint is diseased, this disease is the result of the presence of the floating body, *b*, those in pathological joints, being the result of such pathology

But in many cases it has been difficult, if not impossible, to accurately determine with which of these subdivisions a certain body should be classed. In consequence, they have been divided, more practically, according to their composition, as follows

1, Those consisting of foreign material, fatty tissue, fibrous tissue, fibrin, etc. 2, Those composed of bone cartilage, or a combination of these two

A transition of these bodies from class 1 to class 2 has been suggested, and undoubtedly this change does take place

In class 1, perhaps the most important are the "Rice Bodies," "Melon Seeds," and the "*Corpora Orysoidea*," which as a rule indicate the tubercular nature of the change. These bodies occur not only in joints, but in tendon sheaths, and bursae, most frequently in regions other than the knee. They vary in size from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in diameter, and in color, appearance, and consistency resemble boiled rice. Histologically they are found to be composed of fibrin and are practically structureless. They are supposed to be formed, by the exfoliation of particles of necrotic tissue, by a separation of villous or papillomatous growths from the

synovial membrane, followed by coagulation necrosis, or by the fibrinoplastic properties of the tubercle bacilli by which granulations are converted into fibrous tissue

The lipomata in connection with the knee joint have recently received attention that has evidently been long due them, by numerous writers and especially by Hoffa<sup>1</sup> in his paper before the American Medical Association in 1904. In the cases reported in this contribution to the subject the bodies were of either bone or cartilage, and therefore the discussion will be limited to those bodies coming under that class

According to Mueller,<sup>2</sup> Ambrose Pare, of ligature fame, in 1558, was the first to remove a loose body from the knee joint although its presence was unsuspected until the joint was opened for the purpose of draining an abscess. This particular body happened to be of cartilage, and hence the frequent use of the name "floating cartilage," many times regardless of its histological structure. In 1691, Pechlin was the first to describe the symptoms accompanying this condition. Subsequently cases were reported by Monro in 1726, Simpson in 1736, and by Morgagni in 1746, after which they were no longer considered a rarity.

In 1793 John Hunter<sup>3</sup> considered these bodies at length, and theorized upon their formation in a paper read by Sir Everard Home, and published in Hunter's work entitled "The Blood, Inflammation and Gunshot Wounds." An unusual case is cited in which many such bodies were found in a pseudo-articulation following a non-union of the humerus. He then attributed their origin to the presence of small coagulæ of blood in the joint.

Raney and Solly<sup>4</sup> in 1848 presented theories as to the formation of these floating substances within the joint. After a careful examination of the bodies and the lining membrane of the joints, they conclude that the glands of the synovial membrane instead of secreting synovia, under some influence, produce cartilage instead, which becomes converted into imperfectly formed bone.

Since then many theories have been brought forward to explain the presence and the formation of such bodies, and

even at the present time these points are not definitely known. Among the following will be found the usual explanations

*a* A dry arthritis with an overgrowth of the margins of the articular cartilages

*b* Bony growths that have broken away from their attachments

*c* Infarction of the articular cartilage, with final separation of the infarct

*d* Plate of bone formed outside of the joint and then invaginated

*e* Chondrification and calcification of enlarged synovial villi

*f* An irritation and growth of embryonal cartilage and bone cells in the synovial fringes

*g* Concretions similar to biliary or cystic calculi, the nucleus being either a blood clot, a torn synovial fringe, a foreign body, a lipoma, or a piece of articular cartilage

*h* A portion of articular surface or semilunar cartilage broken off by direct injury

*i* A portion of articular surface or semilunar cartilage damaged by trauma, and subsequently becoming separated

Trauma is considered by many authorities, notably by Barth,<sup>5</sup> and by Vollbrecht,<sup>6</sup> to be the cause of these bodies, but some observers, such as Sir George Humphry,<sup>7</sup> doubt that they are ever caused by traumatism. It is certain that in many cases a history of injury is quite doubtful and in some instances absolutely negative.

Various experiments have been undertaken to determine the relationship existing between these bodies and a previous injury to the joint. Kragland<sup>8</sup> found that upon the cadaver it was impossible to detach a fragment of articular cartilage simply by a blow, an area was loosened in this manner, but in order to separate it, a prying force had to be applied. Codman<sup>9</sup> in a series of similar experiments arrived at the same conclusion.

But Burghard<sup>10</sup> in 1892 found that an oblique blow upon the internal condyle, with the knee flexed, may, with some difficulty, cause a complete separation of a piece of the articular cartilage. Cornil and Coudray<sup>11</sup> in experimenting upon

dogs found that these bodies of traumatic origin became united to the articular extremity of the bone or to the synovial membrane. In one case eight days after the separation of a fragment of the articular surface of the bone, with chisel and mallet, this piece was found united to the condyle by an osseous bridge. H. Rimann<sup>12</sup> found the same result after conducting similar experiments upon goats and dogs. These experiments show that the influence of trauma in causing the formation of these joints is still *sub judice*.

The experiments of Kraglund and of Codman tend to substantiate the explanation offered by Koenig,<sup>13</sup> *i e*, the traumatism injures and depresses a certain portion of the articular surface, and that this portion subsequently becomes detached by a pathological process, a fatty necrosis, called by Koenig "Osteochondritis dessicans."

Sir J. Paget<sup>14</sup> described practically the same process and called it "Quiet Necrosis." Mr. Teale,<sup>15</sup> at about the same time, mentions the same condition but without giving it a special name. Other names that have been applied are "Spontaneous demarcation," by Klein,<sup>16</sup> and "Ostitis," by Kraglund.

Poulet and Vaillaid,<sup>17</sup> after a very complete and extensive study of this subject, arrive at practically the same conclusion relative to traumatism as an indirect etiological factor.

M. L. Harris,<sup>18</sup> in discussing this explanation after drawing attention to the fact that Koenig's paper was written fifteen years ago, said "There is almost no one who reports a case that does not reach the conclusion that Koenig was wrong." Still we find that Gruder<sup>19</sup> has recently reported a case under the title "A Contribution to the Origin of Free Joint Bodies through Osteochondritis Dessicans of Koenig." Martens<sup>20</sup> makes an extensive report from Koenig's clinics at Gottingen and Berlin, including clinical and operative histories with microscopic examinations of the bodies removed. And in the present year, Koenig<sup>21</sup> himself strenuously supports his previous position in a reply to the experiments and writings of Rimann and Cornil and Coudray.

In the absence of a positive history of injury the frequent occurrence of this condition in both knees, while

not excluding traumatism, does seem to render such an explanation less plausible Bowlby,<sup>22</sup> Clutton<sup>23</sup> and Weichselbaum<sup>24</sup> each records cases in which a loose body exactly similar in shape, size and position was found in the knee joints of both limbs Bennett<sup>25</sup> explains the not uncommon involvement of both joints, as being due to the sprain or sudden twisting of the second joint which frequently takes place in the constant effort, made unconsciously, to protect or favor the joint first affected

That these floating bodies of the joint are rarely of purely traumatic origin, was shown by Halstead,<sup>26</sup> who in 1895, after a careful review of the literature, found only three cases of this character, and one of these was doubtful Koenig, Biuns, and many German authorities claim that spontaneous traumatic separation never occurs But Burghard<sup>10</sup> reports one undoubted case of this character and, while admitting their extreme rarity, mentions five similar ones that he collected from the literature

Max Schuller<sup>27</sup> collected 143 cases of floating bodies in the joints and found that 85 were of distinctly traumatic origin, 39 were due to pathological changes, and 19 were unknown But in these the question as to the direct traumatic separation of the fragment is not entered into In many instances it is extremely difficult to determine the role played by traumatism The movable body may lie dormant and not until there has been some injury to the knee do the symptoms present themselves Or, in accord with Koenig, the osteochondritis dessicans may have all but separated the particle of articular cartilage when a comparative slight trauma completes the work

The presence of a defect in the articular surface, approximately equal in size to the floating body, has been frequently noted Instances beautifully illustrating the origin of these bodies from such defects are related by Codman<sup>9</sup> and Lane<sup>28</sup> Harris<sup>18</sup> mentions a case in which the floating body accurately fitted into the defect, and the history of the case extended over thirty-two years

The defect is usually situated on the internal condyle, because when the knee is flexed the patella does not protect



this in so complete a manner as it does the external condyle. But the external is sometimes injured, and MacCormack<sup>20</sup> mentions the case of Bruce Clark, in which the defect was on the articular surface of the patella. A discrepancy in the size or shape may exist between the body and the defect. This may be explained by a partial or beginning regeneration of the articular surface, or by a change in size of the detached fragment. Usually both of these factors will have been responsible for the lack of symmetry between the two.

The defect may be absent, owing to the origin of the body from some other source, or to a complete regeneration of the articular surface (as in Case II).

In a case reported by Wilson<sup>30</sup> in which he removed the body one year after the injury, critical examination of the condyles of the femur was negative, but on the posterior internal portion of the articular surface of the tibia, there seemed to be an irregularity which led to the surmise that this point was the origin of the body removed. Subsequent repair had largely obliterated any cavity that might have been made at the time of the accident.

This loss of substance in the articular surface of the bone even if corresponding, in size and shape, to the loose body does not necessarily mean that the latter originated from the former. Halstead<sup>26</sup> has brought out the point that the free body may possibly originate from some other source and then by pressure atrophy cause a depression in the articular surface, similar in size and shape to the movable body. In the case of Fairchild<sup>31</sup> a bullet was removed from the knee joint after having been in the joint or its neighborhood for many years. The foreign body had worn a groove into, but not through, the articular cartilage.

The history of these fragments after separation is another subject of much speculation. That they increase in size can not be doubted. Cornil and Coudray<sup>11</sup> mention two fragments that measured 7 mm and 8 mm in their longest diameter, but which measured 12 mm and 13 mm at the end of 1 and 1½ months. This augmentation in size they attribute sometimes to the production of fibrous tissue and sometimes to the

formation of new fibro-cartilage. Other explanations are that the increase in size is due to imbibition from the synovial fluid, to the deposit of layers of fibrin from the synovia, or to the deposit of lime salts. Poulet and Vaillard<sup>17</sup> have shown that the fragment which at the time of its origin consists of bone and cartilage, becomes surrounded on all sides by cartilage, and that this newly-formed cartilage differs from the articular cartilage in being more embryonal and irregular.

In Wilson's<sup>30</sup> case the bone removed was found to have two surfaces covered with cartilage. The firm attachment to the tibia, and its vascularity, indicated to Wilson that it had formerly been much smaller.

Codman<sup>9</sup> points out that the growth is chiefly in the cancellated bone, which may at times completely surround the cartilage, and in many cases that the cellular elements are still capable of being stained, which seems to point toward the activity of the osteoblasts. But to show that this power of the bone has not as yet been definitely determined we quote Codman, "*A priori*, however, one would think that growth by concretion and the slow deposit of lime salts would be more likely."

Cornil and Coudray<sup>11</sup> claim that one of the first changes noticed in all the traumatic foreign bodies was a disappearance, more or less rapid, and more or less complete, of the living cells of the bony portion of the fragment. Where there has been noted a reproduction of either the osseous or the cartilaginous cells the nutrition for this growth has been supposed to be derived from the synovial fluid. Barth<sup>5</sup> thinks that the necessary nutriment is supplied through adhesions to the capsule. The pedicle, when present, has so often been found to be non-vascular, that a source of blood supply from this attachment is not to be expected. Yet Barwell<sup>32</sup> thought that many of these bodies originated outside of the joint proper and likens the pedicle to a mesentery.

Blood-clots have undoubtedly become impregnated with calcium salts, and foreign bodies have been surrounded by osseous or cartilaginous material. For example, in the case of Shaw<sup>33</sup> the loose body was found to have, as a nucleus, a fragment of a needle. In this connection, Fairchild's<sup>31</sup> case

is interesting, A Minié ball weighing 440 gm was removed from the knee joint twenty-nine years after receiving a gunshot wound, but only three or four years after the onset of definite symptoms referable to the knee. In a personal communication Dr Fairchild states that the ball was not covered with a deposit, neither was it bright, but of a dull, dead color.

The number of bodies that have been found within the joint varies greatly. They may be single or multiple and so frequent are they multiple that others should always be searched for. Bland Sutton<sup>34</sup> counted 1532 calcareous granules that were removed from a shoulder joint. Berry<sup>35</sup> removed 1047 from a knee joint from which, four years previously,<sup>36</sup> he had removed 50, he also mentions a case in which Mr Thomas Smith removed 400 movable masses of cartilage from a knee. Barwell<sup>32</sup> states that nine tenths of these bodies occur in the knee joint, with the elbow being the next frequent site, and Barth,<sup>5</sup> in his classic work entitled "The Origin and Growth of Free Joint Bodies," found reports of cases in the knee, 55, elbow, 8, shoulder, 2, and wrist, 1. Paget<sup>14</sup> mentions a case of the hip joint, and the articulation of the lower jaw has also been found involved. The ankle is rarely affected, but even pseudo-articulations are not exempt as was seen in the above mentioned case of John Hunter's<sup>3</sup>

*Symptoms*—The symptoms may be very marked, significant, and to a degree almost pathognomonic. The most characteristic symptom is undoubtedly the sudden occurrence of severe sharp shooting pains in the joint, frequently so severe as to cause syncope. And with this pain there is a "locking" of the joint, i.e., an inability to flex or extend the limb. The leg is usually slightly flexed, which is perhaps due to the interposition of the floating body between the articular surfaces, or between the bone and the capsular ligament. Reichel<sup>37</sup> is of the opinion that the body is never caught between the joint surfaces themselves, and cites the case of Lawson in which operation was performed during the attack, and the body was found in this position. In Case I of this series the operation was performed while the joint was locked and the body was found between the capsule and the joint surface. (See Fig 1)

In Case IV (Fig vii) the movable cartilage seemed to occupy a relatively similar position, yet at no time was there locking of the joint. In this case the exact relations of the body were not determined by operation, the body may have been external to the capsule, possibly passing through a tear in the capsule at the time of the injury.

The larger the body, the less acute are the symptoms,

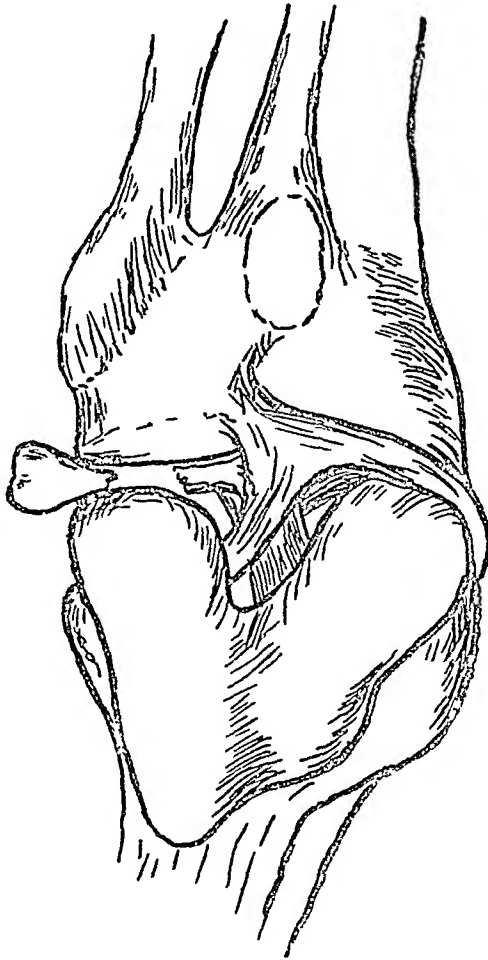


FIG 7

although in cases where the large body exists the attack of pain, while not so severe, is more continuous. This is well shown in Case III, in which the bodies are extremely large. The pain had increased with the increase in size though a locking with its accompanying paroxysm had not occurred in many years.

The locking may last for a variable time, from an instant to a day or two. An acute synovitis usually follows and may persist for a number of weeks. Occasionally the synovitis may be absent, if the locking has been of very short duration. These attacks occur at irregular intervals and generally during the interval the joint is approximately normal.

With the presence of a palpable mass in the joint, or in connection with the joint, the above symptoms will lead to an accurate diagnosis, but on the other hand, with the absence of any visible or palpable mass in the neighborhood of the joint, differentiation from the other causes of "Internal Derangement of the Knee" will be arrived at only with great difficulty, if at all.

The different pathological conditions that may be included under the caption "Internal Derangements" have been classified, according to their frequency, by Tenny<sup>38</sup> as follows: Tabs from lubricating apparatus, Erosion of cartilage, Damaged and displaced semi-lunar cartilages, Ruptured ligaments, Free and loose bodies, Villous and papillary synovitis.

Damaged or displaced semi-lunar cartilages are perhaps the most frequent condition confused with the free or loose bodies. This condition was first described by Hey,<sup>39</sup> of Leeds, England, in 1803, and was called "Hey's Internal Derangement of the Knee." It was treated by splints, supports and appliances. In 1885 Mr Annandale,<sup>40</sup> of Edinburgh, followed closely by A. W. Mayo Robson,<sup>41</sup> of Leeds, operated for the relief of this condition.

With the adoption of the radical cure abnormal semi-lunar cartilages have been assuming a position of more importance. As showing the relative frequency with which these two conditions are encountered, Allingham<sup>42</sup> found 12 cases of loose body and 35 cases of pathological condition of the semi-lunar cartilages in 59 cases operated upon for internal derangement. In 33 operations of this character performed by Robson,<sup>41</sup> 21 were for damaged semi-lunars and 12 for free bodies in the joint. In 106 cases of internal derangement which came to operation, Bennett<sup>25</sup> removed the semi-lunar cartilages 80 times and loose bodies 16 times. In 505 cases of recurrent effusion of the knee joint the same author found

obvious symptoms of loose body in 21 cases. That the differential diagnosis between these conditions is at times most difficult will be shown by the following case reported by Hubbard,<sup>43</sup> which had been examined by many men and was frequently diagnosed as a slipping cartilage. The patient was seen by Dr R F Weir, of New York, who, after a careful examination and a knowledge of the history of the case, was of the opinion that the inner semi-lunar cartilage was the seat of the trouble and advised operation. At operation the cartilage was found to be thickened but this was not deemed sufficient to account for the symptoms. Manipulation of the limb allowed the escape of three unsuspected floating cartilages. Allingham<sup>42</sup> cites a case in which his diagnosis of damaged semi-lunar proved at operation to be a loose body.

He gives as characteristics of damaged semi-lunar cartilages *a*, distinct history of traumatic origin, *b*, well defined site of pain, either internal or external according to the cartilage damaged, *c*, no foreign body palpable, and *d*, no creaking in the joint.

Cotterill<sup>44</sup> makes the point that in damaged semi-lunars full extension is painful, while full flexion is painless. The X-ray may be of value, in that loose bodies will practically always contain bone, and therefore cause a shadow, while the separated semi-lunar, being of cartilage exclusively, will not show in the skiagram.

Under the title "Treatment of Puzzling Knee Affections" Hoffa<sup>45</sup> mentions the cases that were hitherto called "Neuralgia of the Knee," and states that many such cases are due to certain definite pathological changes within the joint, among which he includes free bodies.

In reporting four cases of "Contusion and Laceration of the Mucous and Alar Ligaments and Synovial Fringes of the Knee Joint," Flint<sup>46</sup> mentions a very instructive instance. Case IV, in which at examination there was a sensation of something slipping beneath the fingers in the swollen region. At operation, the mucous ligament was found free in the joint with a thickened jagged margin. On manipulating the joint this reddened area comes to be between the outer margin of

the patella and the condyle of the femur, and corresponds to the mass felt to slip beneath the finger before the operation

*Indications for Operation*—After the diagnosis is fully established there is no question but that the joint will continue to cause trouble until the offending body is removed. There is always a possibility that the free body may become attached in some cul-de-sac in an out-of-the-way location, and give rise to no further trouble, but such a fortunate contingency rarely occurs in actual practice. If the body is in such a location and giving rise to no disturbance it should not be disturbed. They should not be removed merely because they are present, but because they are causing symptoms and disturbing the function of the joint.

In case of doubtful diagnosis, rest, splints, massage, etc., should be judiciously tried before advising operation. Exploratory incision of the joint is allowable in certain cases. Allingham,<sup>42</sup> in 59 cases operated upon, found nothing abnormal in 3 instances. Bennett<sup>25</sup> made an exploratory incision 12 times in 106 operations and in 5 of these nothing was found to account for the symptoms, but in 2 of these 5 the exploration was followed by relief of the symptoms. Goldthwait<sup>47</sup> advocates incision and explorations not only for the various causes of internal derangement, but also in doubtful cases for diagnosis. The cases of Flint<sup>40</sup> were operated upon for exploratory purposes. Absolute diagnosis was not possible, but it was highly probable that some lesion would be found.

*Treatment*—The treatment should be the removal of the offending body. The old classification into treatment by (a) direct incision, and (b) indirect incision, is no longer of practical value, and the second subdivision only of historic interest. Under perfect aseptic environs the operation is practically devoid of danger. The fact that there is danger in the opening of a large joint like the knee is established beyond cavil, but that the danger has been practically removed when operating under favorable circumstances is also well recognized. The joint must be approached with as much care and

solicitation as when we invade the peritoneal cavity. These two serous sacs, the peritoneal and the synovial, are similarly susceptible to infection, with the peritoneum being more tolerant. The power of the peritoneum to take care of a certain amount of infection is well known. The serous lining of the joint cavities is not so resistant. The absence of a structure analogous to the omentum, "the policeman of the peritoneal cavity," may account in part for this difference. This well-known lack of resistance of the joint makes it necessary to exercise the utmost caution in the operation.

As showing how much disturbances may be caused by invading a large joint even though no sepsis is present, J. H. Baibat,<sup>48</sup> reports a case in which, 48 hours after the removal of a large body, there was great pain, pulse 120, temperature 101 F, with the knee swollen and tender. He removed a skin suture and allowed about two ounces of bloody serum to escape, which on culture media proved to be sterile. More serum was removed two days later, and on the twelfth day the condition was normal. General anesthesia is not always necessary, and the employment of infiltration anesthesia should be considered, if not used, in every case. In Case I the body was removed in a manner perfectly satisfactory to both patient and operator after infiltration with a solution of eucaine lactate gr. 1 to the ounce or normal salt solution, to which was added gtt. 4 of adrenalin chloride 1-1000. Houghton<sup>49</sup> removed a floating cartilage from an extremely neurotic individual after a similar analgesia and even tapped the articular surfaces with a knife without any objection being made by the patient.

The incision of the skin and that in the capsule of the joint should be on different planes, as a safeguard against the extension of a possible superficial infection from without inward. The incision should be located so as to expose the body, to be removed and at the same time permit of an examination of the corresponding condyle of the femur. The incision generally employed is longitudinal at either side of the patella but this is not always sufficient to secure all of the bodies especially if they happen to be numerous, situated behind the condyles, or attached. In some cases a more exten-



sive operation, with transverse division of the patella and complete exposure may be necessary, as in the case of Loids<sup>50</sup> in which he removed ten bodies Sir William Banks<sup>51</sup> removed 40 after incising the tendon of the quadriceps and turning down a lower flap which contained the patella These more serious operations are fortunately but rarely indicated

The gloved finger may be used to palpate the articular cartilage In this manner partially detached fragments have been discovered and removed, saving the patient from the necessity of a future operation In dealing with the knee joint the "fingerless" operation has been insisted upon by many authorities, such as Koenig and Hoffa, but since the introduction and use of rubber gloves, which are essential, it would seem that the objections to digital palpation of the articular surfaces have been overcome

These floating bodies of the joints are aptly called "gelenkmaus" by the Germans, because of their liability to disappear during the anesthesia or the operation unless such a contingency has been considered and measures taken to prevent it The suggestion that a needle be passed through the skin and the body in the joint is not always practicable Elastic constriction of the limb above and below the floating cartilage usually prevents it from slipping into the joint and out of sight at an inopportune moment

The results following the removal of these bodies show a marked improvement, due without question, to the introduction and practice of aseptic surgery

Paré<sup>2</sup> was the first (1558) to remove a loose cartilage from the knee joint, after which, removal by direct and indirect incision was performed with increasing frequency In 1860 Larry<sup>52</sup> collected all of the cases up to that time, 170, of which 117 were successful, 33 died, and 20 were failures Nine years later Benndorff<sup>32</sup> collected 169 cases, 109 with success, 46 deaths and 14 failures Barwell<sup>32</sup> found 88 cases between 1860 and 1875, 73 successful, 5 deaths and 10 failures The failures were ineffectual attempts to operate by the indirect or subcutaneous incision of the capsule, which method has been obsolete for many years

Muller<sup>2</sup> in 1886 gathered 190 instances of operation for

the relief of this condition, with 96 per cent recoveries and 4 per cent deaths Woodward<sup>53</sup> up to 1889 found 104 cases with six bad results, 2 amputations and 1 death Marsh<sup>54</sup> mentions 72 instances of operative removal of these bodies between the years 1885 and 1895 with no deaths and 10 failures During these same years Bolton<sup>55</sup> states that no fatal results has been recorded Cloudot<sup>56</sup> found no death from an operation for this condition reported since 1877 Tenny<sup>38</sup> in 1904 found 297 cases since 1895, with no amputation and no deaths

These late statistics are certainly interesting and encouraging when compared with the words of Benj Bell<sup>57</sup> who, in 1787, while speaking of those bodies in the knee joint that are not freely movable said "In this case I would advise *amputation of the limb* The remedy is no doubt severe, but it is less painful as well as less hazardous, than the excision of any of these concretions that have been attached to the capsular ligament"

#### REPORT OF CASES

CASE I —D S, male, forty years old, miner, Irish Previous History Fracture of right leg above the ankle about eight years ago, recovery perfect During life he had received many more or less severe sprains, bruises and falls, and in his occupation he had frequently injured his knees, but had no recollection of severely injuring either joint Present illness began about eight months ago, with an injury to his left knee While timbering, in a crouched position, his right knee on the ground with the left limb abducted and semi-flexed, the foot on the ground and the knee about six inches above the ground, the force of his blows upon the timbers dislodged some particles of rock and a piece weighing about four or five pounds fell a distance of about ten or twelve feet, and struck his left knee, bringing it forcibly against the ground

He experienced severe pain in the knee and the entire limb but in about an hour he was able to ride (horseback) to his home After nursing the joint for a few days, he was able to walk about, but with a decided limp, due to the stiffness and soreness which remained for some weeks About a week after the accident he consulted a physician who treated him for rheu-

matism, he became no better, and since the injury the knee had been weak and unreliable, allowing him to work only a few days at a time. The joint was always sore and painful, but at irregular intervals there was a sharp shooting pain with a locking of the joint, lasting a variable time from an instant to half an hour. After these attacks of acute pain, the knee was swollen and tender to touch and painful upon motion. Hot application usually relieved the pain and reduced the swelling.

Six months ago, after one of these attacks of locking of the joint, he noticed a swelling located upon the inner aspect of the knee, at about the lower edge of the patella. Two months ago, after a like attack, a similar swelling appeared about an inch above the head of the fibula. These swellings were about the size of an ordinary bean, hard, immovable, and very tender, they remained visible for about three or four hours in each instance and finally disappeared without the knowledge of the patient. Hot cloths were applied each time, and caused relief from the pain. On February 6, 1904, while splitting wood, he slipped, twisted his knee, and had another attack of acute pain but much severer than the preceding ones. He dragged himself from the yard into the house, and on examining the knee, found a swelling a trifle larger than the previous ones, in the same location that it had assumed at the last attack, *i e*, above the head of the fibula. (See Fig I.)

The writer was called, and examined the joint about one hour after the onset of the attack. The joint was not swollen, mensuration showed both joints to be of the same dimensions, there was no fluid in the joint, the limb was flexed at almost a right angle, the motion was very limited and painful. The entire left knee was very tender, though the pain at this time was greatly lessened to what it had been, hot applications had been continuously applied. The greatest tenderness was in the neighborhood of the small swelling, pressure upon which caused exquisite pain. This mass, a trifle larger than an ordinary bean, was immovable, very hard, and the skin which was not reddened, moved freely over it.

A diagnosis of floating cartilage was made, and its immediate removal advised, but the patient would only consent to operation, on the following day, if the symptoms did not disappear in the



FIG 1



FIG 2

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FIG 3

mean time Consequently a hot moist dressing with a posterior splint was applied On the following day, as the conditions were practically the same, the patient was removed to St Vincent's Hospital Operation February 7, 1904, assisted by Dr J A Jeannotte After the usual preparation and before the incision an elastic band was applied around the knee, above and below the body to be removed, to prevent it from slipping into the joint during the maneuvers that might be necessary in its removal Anesthesia by infiltration, with eucaine lactate gr 1, normal salt solution oz 1, adrenalin chloride, 1-1000 gtt 4 was perfectly satisfactory

An incision one inch long was made parallel to the long axis of the limb over the tumor, which was situated an inch above the head of the fibula, Skin fascia, and capsule of the joint were all divided and the mass of cartilage was grasped with a sequesterum forceps and easily delivered It was then found to be attached by a membranous pedicle, this was ligated, divided, and the cartilage taken away The capsule was sutured with plain catgut, and the skin with silkwormgut A collodion dressing applied and the limb put up in plaster paris

On the seventh day the plaster bandage was taken off and the stitches removed, on the tenth day the patient was discharged from the hospital, with the normal function of the joint The body that was removed (see Figs II and III) measured 1.5 cm in length, 5 cm in thickness, and 5 cm in width Its external surface is convex, bony and rough, with many indentations, the inferior surface concave, bony, and 5 cm broad, the superior surface is convex, bony and narrow terminating in a distinct ridge The internal surface is flat and covered with a layer of cartilage about 1 mm in thickness At one extremity of this body, the one to which the pedicle was attached, there is found a distinct particle of bone about 1 by 3 mm in size, and this is held to the larger fragment by the cartilage in which it is embedded

Two months after his discharge, Mr S informed me that he had been entirely well up to a few days previous, when he had an attack very similar to those with which he suffered before the operation, with the exception that the pain was not so severe A small swelling, about half the size of the body removed, presented

itself at the inner and lower aspect of the patella, the location in which he first noticed such a swelling about eight months previous. This swelling was noticeable for about half an hour, and the soreness of the joint was practically all gone the next day. He was told that there was certainly one, and perhaps more such bodies as had been removed still in the joint, and that the next time one presented itself he should come to the hospital at once and have it removed.

Four months later the patient again presented himself and reported that the knee was bothering him considerably. He said that he could feel a swelling down deep in the muscles of the upper portion of the calf of the leg. A few days before his visit, it had returned to its old location, at the inner and outer border of the patella, and had remained there all day, but the following morning it had disappeared and he felt much better. Examination of the knee at this time, was absolutely negative, the joint was apparently normal. The cicatrix of the operation was barely visible and caused no inconvenience.

CASE II—J G, male, forty-two years, switchman, American. On March 4, 1904, a locomotive ran over his right leg. He was immediately removed to St Vincent's Hospital, where an examination revealed a crushing injury to the bones and soft parts of the right leg, which necessitated an amputation above the knee joint. Upon opening the knee joint a large floating cartilage popped out. This body (see Figs IV and V) resembles a pumpkin seed in size and shape, it is 2.5 cm long, 1.5 cm wide and .5 cm in thickness. One surface is hard, bony, and very rough and corrugate, with many large and small eminences and depressions. The opposite surface is slightly convex, its edges are raised and fluted, and the area within these raised edges is smooth and covered with a thin layer of cartilage. One pole of this body is broad, and the other comes to a point, and at this point there is attached, by a fibrous band, a very small spherical solid mass, in structure apparently similar to the bony part of the larger body. This small body is about 2 mm in diameter and resembles a mustard seed. The joint was very carefully examined, but beyond a thickening of the synovial membrane there was nothing abnormal. The articular surfaces gave no clue as to the origin of the body.

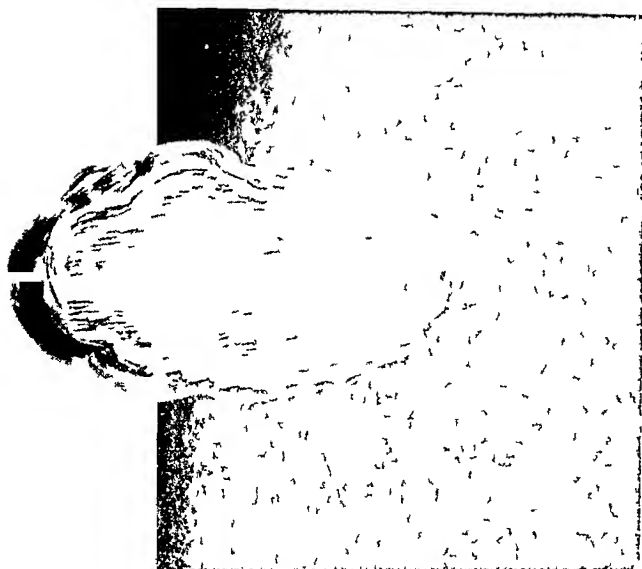


FIG 4

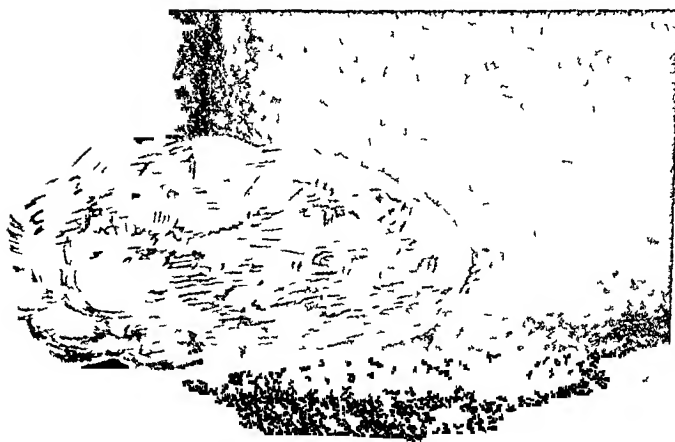


FIG 5





Upon inquiry, after the patient was convalescent, it was learned that he had, for many years, suffered with "rheumatism" of the right knee. He frequently had sudden attacks of sharp shooting pain in the joint, that would almost cause him to faint. With this intense pain, he could not move the joint nor even rest his foot upon the ground, but would have to lean against some stationary object until the pain had passed away. On more than one occasion he failed to catch a switching engine or car, because of this sudden pain which would make it impossible for him to move. In duration these attacks were always short. He never noticed any marked swelling of the joint, and after the attacks had passed away, he could go about his work as before, except that there would be some lameness, and that the joint might be sore and tender for some hours or days. He never had any trouble with the other knee, or any other joints. There was no history of any distinct traumatism.

A striking feature common to those two specimens is the smaller bony mass in connection with each. In review of the literature obtainable, reference to such small adherent particles is not found. Their significance is obscure, it would seem that they might be the origin of an additional body, and in the first case reported, where there was more than one body this explanation might seem tenable, but in the second case, it would seem that there had been ample time for a more advanced development of this second body. The presence of these smaller bodies in these two instances may be merely a coincidence, but if they are met with more frequently, they may be found to have a bearing upon the question of the formation of these floating bodies in the joints.

CASE III—T. T., male, aged forty-one years, policeman, American. Previous History. Had most of the diseases of childhood, and "chills and fevers" when a youth in Missouri. When thirty-two years of age, had a severe attack of inflammatory rheumatism, all of the large joints were involved, the knee no more than others, with which he was confined to bed for six weeks. In his thirty-third and thirty-fifth years he had similar attacks of rheumatism, each of which lasted about six weeks.

Since then he has not been troubled with rheumatism or any other form of sickness Present illness —When fifteen years of age, he was riding horse-back, dismounted to open a gate, and in again mounting slipped and fell, but grasped a tug of the harness and was dragged along the ground head foremost for a distance of about twenty feet He did not seem seriously injured, but there was a small triangular cut over the center of the right patella, as he remembers it this cut extended to the bone The knee was somewhat swollen and slightly painful for a few days, during which time he remained in bed, and local applications were applied In a week or ten days he had entirely recovered from the accident and was using the joint as usual

About six months after this accident, he had his first attack of locking of the knee joint While walking, feeling perfectly well, he experienced a severe sharp shooting pain in the right knee, which caused him to sink to the ground, he could not move the joint, but this pain and inability to move the joint soon passed away, and he was able to resume his walk But there was considerable soreness remaining in the joint for a few days Since then attacks similar to this one occurred at irregular intervals, four to six in a year, for a number of years They never necessitated his being confined to bed

About five years after the injury to his knee, there being no injury during the interval, he noticed the presence of loose movable bodies in the right knee It seemed to him that there were many bodies in the joint, behind and on each side of the patella They were about the size of a pea and some of them as large as a bean He could feel them grate against one another or against the bones of the knee joint, and at times they would "pop" quite loudly, and would then cause moderate pain Since first noting these movable bodies, he has always had trouble with the joint, has had "rheumatism," and the joint is a perfect barometer, always increasing in pain before the coming of a storm The longest time that this knee has caused him to remain in bed has been about four or five days, only a few times He admits, however, that he has many times hobbled around when it would have been much better for him had he rested The use of strong liniment and the application of hot flannel cloths generally relieved the acute pain, and he was able to put up with the soreness

About four years ago, the joint became ankylosed for about five days, this is the only time that such an occurrence has taken place. At present there is an almost constant pain when the joint is in action, but when at rest there is no pain. The limb remains a trifle flexed at the knee, and there is a slight eversion of the leg. The gait is very good, considering the pathology within the joint, it may be plainly seen, in walking, that one joint does not move as freely as the other. The patient states that the pain in the joint is much worse now, since these bodies became larger, than it was when the bodies were small, but he has not had the acute attacks of pain, with locking, for many years. The duties of a policeman are performed without any great apparent effort.

**Examination** Well developed and nourished man, head, thorax, and abdomen negative. Both limbs of the same length, patella reflex normal on both sides. Left knee normal. Right knee  $\frac{3}{4}$  of an inch larger than the left. Extension perfect, but extreme flexion is resisted and causes some pain. There is slight abduction of the leg. Passive and active motions of the knee are accompanied by crepitus. There is an effusion into the joint, the patella floats, but the normal depressions above and on each side of the patella are not obliterated. Palpation reveals a hard, resisting, movable mass about one half the size of the patella, situated below the tendon of the quadriceps extensor muscle. This mass can be moved laterally and also up and down, but only a small distance in either direction. It is not sensitive. A smaller body, about  $1\frac{1}{2}$  by  $\frac{1}{2}$  inches can also be felt, this body is freely movable and can be made to pass from the median line above the patella to the center of the right lateral aspect of the patella. This body is quite sensitive, and with its movements crepitus can be distinctly felt and heard. Sometimes this movable mass becomes lodged behind some muscular or tendinous structures and cannot be palpated, but some few maneuvers on the part of the patient can usually bring it within reach of the palpating fingers again. These are the only movable bodies that can be palpated but the patient states that occasionally a swelling can be felt in the popliteal space. The internal portion of the head of the tibia seems to be uniformly enlarged, and the tibial tubercle, the attachment of the patellar tendon, seems to be

enlarged and extended laterally and superiorly, on each side of the patella (See Fig VI)

CASE IV—G V, male, thirty-six years, laborer, Italian Previous History negative Present illness Entered D & R G R R Hospital, because of a simple fracture of both bones of the right leg at about the middle In addition to the above, at examination there was found a swollen, tender and painful right knee joint With the rest and immobility necessary in the treatment of the fracture the knee rapidly improved After union of the bones and removal of the cast, the patient complained of some pain, soreness, stiffness, tenderness, and creaking in the joint upon motion Examination of the knee revealed the presence of some fluid in the joint, a slight abduction with marked lateral motion of the leg, complete extension caused no pain, but flexion to a right angle caused pain, with crepitus that could be distinctly heard and felt It was impossible to locate the seat of this crepitus, there was no acute pain with it, but when the leg was flexed the patient complained of pain which he located in the center of the popliteal space On the external surface of the knee between the condyle of the femur and the articular surface of the tibia, there could be felt a mass about  $\frac{1}{2}$  inch wide and  $\frac{1}{4}$  inch thick This was movable, when pushed toward the center of the joint it seemed elastic and would spring back to its former position The up and down and the anterior posterior motions were limited The mass was not tender, nor was there any pain complained of when it was moved Operation for removal of the body was advised but refused Under rest and counterirritation, with pressure, the fluid was absorbed, the motion became much better, the abduction less marked, and the crepitus almost absent But the mass could be palpated in the same position

In the absence of operation and a presentation of the specimen, the propriety of including this case with the others may be questioned

The mass in this case was certainly a movable body, outside of the joint, but its origin must have been within the joint, either from the articular surfaces or from the semi-lunar cartilages After a careful study of the case I am constrained

to class this with the three cases of Bennett's in which a piece of the semi-lunar cartilage is torn from its connections anteriorly and then pushed forward, in this manner producing a tumor readily felt under the soft parts. Usually when the semi-lunars are damaged they are forced into the joint, or retain their normal position. In these cases a part of the cartilages is forced outward, as is very well shown in Fig VII, taken from Bennett <sup>25</sup>

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# AN EXTERNAL METAL SUPPORT FOR DIRECT APPLICATION TO THE SHAFT OF A FRACTURED LONG BONE

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DAVID J, a laborer, forty-five years of age, while working in a steel foundry on the 26th of December, 1901, was injured by a heavy steel beam falling across the left upper arm. A few hours later I saw him at St Luke's Hospital in a condition of mild shock with a temperature of 98.6, a pulse of 80, and a respiration of 24. It was quite evident on first inspection that the arm had been about as badly damaged as was possible without it being completely severed from the body. On the anterior aspect was a large irregular wound through which one end of the humerus protruded, while the other extremity of it stuck out of a similar lesion on the posterior surface of the arm. The skin was torn for a distance of about two-thirds the circumference of the arm, the anterior wound reaching obliquely to the fold of the elbow, while the posterior extended longitudinally from the middle of the arm almost to the shoulder. More than half of the muscular substance seemed to be divided transversely and the bone, in addition to being the seat of a compound fracture as just mentioned, was also splintered for a short distance. The great vessels and nerves were not seen, though it is presumable that most of them escaped serious injury, since the pulse at the wrist and sensation over the lower arm and hand were practically uninterrupted. From the above somewhat inexact description, it will be seen, at least, that so much of the continuity of the member had been interrupted as to make the question of saving it a very grave and doubtful one. The patient was anesthetized at once, the ends of the humerus squared off and united by a through and through wire, necessitating some two inches of shortening. All blood clots, shreds of tissue and dirt were removed, but no attempt at primary suture of the soft parts was made, owing to their crushed, devitalized condition. A



rubber tube was drawn clear through the arm, the anterior and posterior defects stuffed out with gauze, and a very large aseptic dressing applied. No attempt was made at any form of permanent splint, since it was found that the soft parts over the two extremities of the humerus had been so extensively damaged as to make it a matter of impossibility to encircle one or both of them in such a manner as to insure support. Hence, as I say, I contented myself with merely wiring the bones to keep their ends from further damaging surrounding structures, and devoted my efforts to averting a general infection until some form of mechanical support for the bones could be devised and applied. The day after the operation the patient's condition was satisfactory in every particular, and on the second day his temperature arose to 101.6, the highest which was recorded during his convalescence. Four days after the injury he commenced to suffer great pain in the injured member, and this persisted until the ninth day, when the parts were placed at rest in the manner now to be described.

With the arm flexed at the elbow I applied a plaster bandage which included the chest, forearm and hand, the upper arm being left free, of necessity. A steel arch anchored at one end in the plaster enclosing the chest, and at its other in the bandage around the forearm, was suspended just above the upper arm. Beneath this arch was placed a vertical rod, which had attached to its lower extremity the silver splint shown in cut No. 1. This rode upon the ends of the bone like a saddle upon a horse, and prevented their natural tendency to rise up out of the wound, while an extension of the vertical rod fitted between the ends of bone, thus keeping the apparatus from gliding toward shoulder or elbow. However, under the influence of this direct splint the free bony ends showed a decided tendency to point downward and project through the gap on the posterior surface of the arm. Hence five days later a silver wire was passed under each extremity and carried out through the anterior wound, to be attached to the steel arch above. After this was done the humerus remained absolutely rigid, there was no difficulty in dressing the large anterior wound by stuffing gauze in around the rod and the wires, the patient was occasioned absolutely no inconvenience by the apparatus, and except for tightening the wires as they

stretched the appliance caused us no concern during all the weeks that it remained in place. It is worthy of note that there was no more spontaneous pain after the application of the splint, although there had been a great deal before. Six weeks after the injury a new plaster bandage was applied, this time the arm



FIG 1

straight at the elbow, but the silver splint and the wire swings were left in position. At the expiration of seven weeks the two silver wires which had held the bone up were removed, and I was delighted to find that there was now no longer any tendency for the splint to force the humerus downward, showing that there

must be a reasonably firm union of some sort. It was, however, not until eight weeks had elapsed after the injury that I ventured to remove the anterior silver splint, when, to my great satisfaction, it was found that there was a decidedly firm union, although at this time it cannot have been a bony one, for the bone could be slightly bent at the point of fracture. Three days later the bone suture was removed for fear that it could not remain without symptoms, in what had been for so long a time an infected wound. Though all supports of every sort were out of the wound and the bone was reasonably firm and seemingly in good condition, the arm was now apparently a shapeless and useless mass of tissues, so long had it lain in splints. The hand and fingers were so œdematous that the patient could not bend any of the joints in them, and hence our efforts from this time were to reëstablish the physiological functions of the part. On March 7th, that is, ten weeks after the injury, the patient sat up for the first time, and two days later the last cast was removed from the arm. On March 17th,—that is, almost twelve weeks after he was hurt, it was necessary to anæsthetize him and break up the adhesions which had formed in all the joints. It was possible to do this without disturbing the newly formed union at the site of fracture and as a consequence a considerable degree of motion was possible in all of these joints which had previously been stiff. On the 10th of April, fifteen weeks after the injury, the patient was discharged from the hospital. There was still some œdema of the hand, though all the wounds were healed, and he possessed something like half motion in all of the joints. Six months later I saw the man, and was gratified to note that he could feed himself, take off his hat and put it on, and otherwise perform most of the functions which are expected of a healthy arm. The amount of strength now possessed by the member cannot be better shown than by adding that he can carry a hod full of coal or a bucket full of water without discomfort and without the slightest evidence of movement in the shaft of the injured bone. Dr Clopton has made an examination with the fluoroscope, and tells me that he found the bone ends in perfect apposition, the axis of the shaft relatively straight, and presumes, from the fact that an extremely heavy shadow was cast by the callus, that the union at that time must have been bony in nature.

It is of interest in this connection to review briefly the various methods which have been adopted for the accomplishment of a firm union in compound fractures or those which have failed to unite primarily. These may be best divided into two groups, the first of which shall include the various appliances which can be completely incorporated within the extremity, and the second group made up of those which communicate with the exterior of the part. Under the first heading come the various forms of wires, nails, screws, plates, etc. Boeckel was the first to use ordinary screws in approximating the ends of oblique fractures, and is said to have accomplished some very desirable results in this manner. A double nail was used by Gussenbauer. This was an appliance shaped somewhat like a broad letter U, and each extremity of it penetrated a half of the fractured bone. Some sort of an ivory or absorbable bone rod was inserted into the marrow at the site of fracture by Bucher, and Von Bruns. Senn introduced a valuable aid in the treatment of oblique fractures of the thigh when he proposed his bone rings a few years ago at a meeting of the American Surgical Association. So enthusiastic over this proposition was Ricketts that he termed Senn's bone rings the most rational means yet proposed of treating this form of injury. Ivory plates were tacked or screwed to the fractured bone by Sick, while similar plates of silver or other metal have been used, and in many instances with excellent results by Agnew, Redard, Steinbach, Martin, and White. In some respects the most nearly physiological, hence, the most nearly perfect of all the appliances which have been incorporated into the structure of a fractured part, is a bony flap. This has been successfully performed by Wolff, Mueller and Scheuer. This last-named author transplanted a rib into the shaft of the humerus, dividing the pedicle fourteen days later, and in this way accomplished a perfect result. This practically completes the list of the heteroplastic and autoplasmic methods which have been advised for repairs of this kind.

Of the appliances which have held broken bones together, and at the same time communicated with the external world, but one has met with a marked degree of success up to the present time. I refer to Parkhill's clamp, which consists of

four parallel screw rods, two of them being driven through each portion of the bone and then held together outside the arm by wing-plates. The second appliance which I will mention as having a similar end in view is the one which I have presented herewith. The appliances to be incorporated will be passed with a mere mention since they have in reality no bearing upon the discussion at hand. In comparing these two methods, which contemplate an open wound and a communication with the exterior, I have no word of criticism for the Parkhill apparatus. The excellent results obtained by Parkhill, and with the same apparatus by Bennett, speak for themselves, but I will state that my appliance is decidedly the simpler of the two, can be quickly and cheaply made anywhere by anyone, and is certainly easier to apply than the other. It is surely not a very easy matter to drill four holes perfectly parallel, as must be done in applying the Parkhill apparatus. Again, the application of it takes some little time and must often be done during the shock which supervenes upon a serious injury, and last, but not least, the relation of the parts must be considerably disturbed in order to carry out the process.

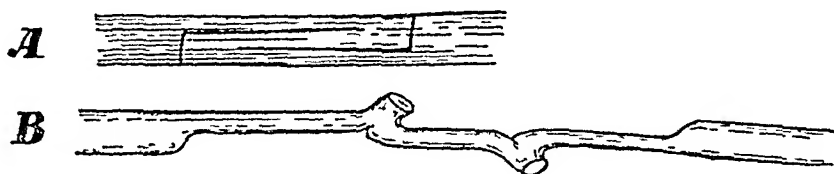
As I have stated, it is a very simple matter to place my apparatus in position. All that is necessary is to square off the ends of the bones a very little, hang a wire under each, and place the little saddle upon them. Furthermore, it is extremely easy to remove the entire apparatus when its purpose has been accomplished. In the case at hand this was done without the use of any anesthetic, general or local, and the patient complained of no pain whatever. There was no necrosis as a result of pressure, and I must express myself as pleased in every way with the result accomplished. I claim further for this simple procedure a far wider field of usefulness than is possible where any of these other devices are used. The proposer of each of these others has been careful to state that a well-fitting plaster cast or other splint must be applied to the portion of the extremity injured in order that his apparatus may best subserve its function. Now, it will be remembered that in my case the soft parts were injured from the shoulder to the elbow, making it manifestly impossible to apply any sort of splints which might remain in position anywhere between

the two points mentioned My only possible points of anchorage were the chest and the forearm, hence, it will be seen that the device here employed meets the requirements of cases in which all methods must fail which depend in any sense upon a permanent cast applied between the shoulder and the elbow There is no reason why it cannot be used in a fracture of the thigh, or in one of any other long bone for that matter, and I especially recommend it in just those most extensively lacerated cases where an extremity might be lost or permanently deformed if any dependence had to be placed upon an external splint for the part

grafts on the other two The Thiersch graft was followed by a severe recontracture, while the Wolfe grafts were followed by excellent results

No report of tendon lengthening in these contractures has come to the writer's notice, although it must have been done many times The method here used was that proposed by Hibbs<sup>6</sup> for lengthening the tendo Achillis

It is more rapid than making long diagonal division and sewing the ends together, and no stitches are left in the tendon. Whether fewer adhesions result is debatable



HIBBS' METHOD OF TENDON-LENGTHENING

#### CASE HISTORIES

CASE I—M N, History No 2, series 3, aged thirteen years, was admitted to St Mary's Hospital, November 13, 1900 In early childhood she had received an injury from a pistol-hammer, this resulted in a contracture of the terminal phalanx of the right ring finger, which was drawn forward and outward and was firmly held at right angles with the rest of the finger, extension was impossible

November 22, under ether, the contractile band was excised The cicatricial tissue extended down to the capsule of the joint The deep flexor tendon was so much contracted that it had to be lengthened, in order to extend the end of the distorted phalanx The joint seemed normal A Wolfe graft was cut from the thigh and sewed into the denuded area with fine silk stitches Rubber tissue was applied and a firm protective dressing This was left in place for two weeks, the outer dressing was then removed, leaving the rubber tissue in position The dressing was changed at intervals of about a week until six weeks from the time of operation The epidermis loosened from the flap and came away, but the true skin adhered to its position and was very firm The motion in the joint remained good (see photograph) The

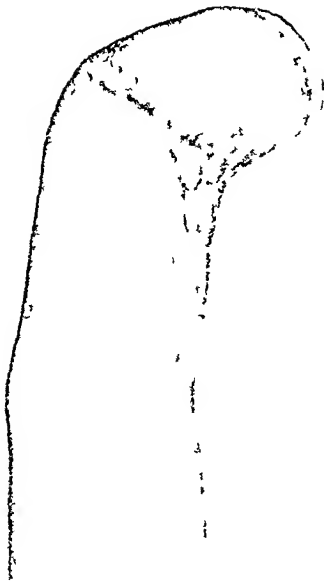


FIG 1—Cicatricial Contracture of Right Ring Finger, of ten years duration

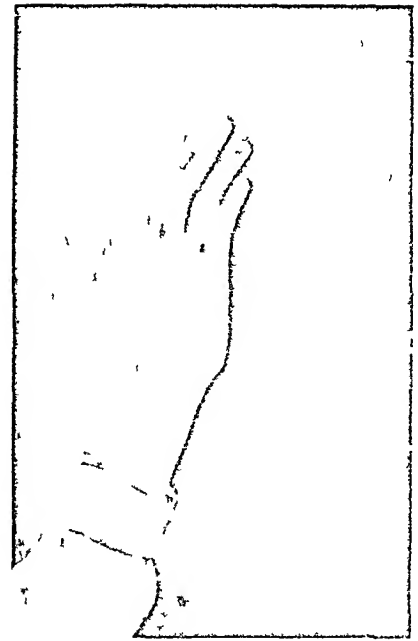


FIG 2—Photograph of Hand two years after operation Posterior view



FIG 3—Photograph of Hand two years after operation, Lateral View, Fingers extended

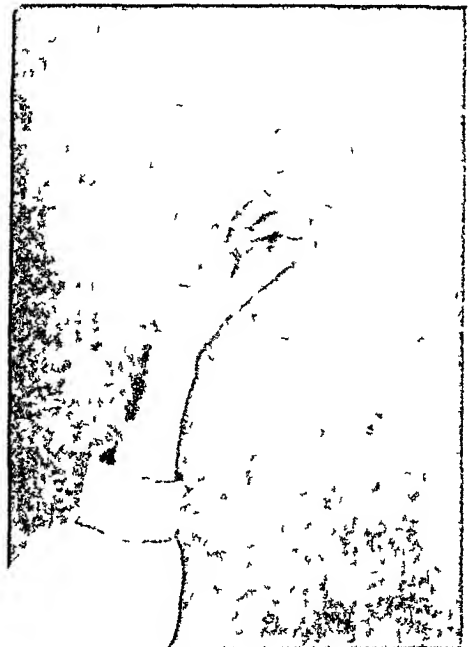


FIG 4—Photograph of Hand two years after operation Fingers flexed



# PLATE II (CASE II)



FIG. 1—Contracture of Thumb and Index, following Burn



FIGS. 2 and 3—Radial and Ulnar views of Hand, one and a half years after the beginning of treatment

patient was seen two and three-quarter years after the operation, there was no return of the contracture and no loss of motion. She has since died of phthisis.

CASE II—N P (History No 1382), aged four and one-half years, admitted to St Mary's Hospital, April 21, 1904. One year ago clothing caught fire and extensive burns of face, hand, forearm and abdomen resulted. The consequent deformity in the hand was excessive (see photograph), the thumb was drawn almost over to the flexor side of wrist and held by firm cicatricial tissue, in a similar way the little finger was drawn onto the palm, and the ring finger half way there.

April 29, 1904. The scar tissue was dissected away from the base of the thumb, the extensor tendons of the thumb, which were much contracted, were lengthened. The hand and thumb could then be extended nearly to their normal positions. After the edges of the skin were stitched there were two irregular defects in the skin, one  $2\frac{1}{2}$  by 1 inch and the other about 1 by  $\frac{3}{4}$  inch. These were filled in with Wolfe grafts, which were stitched into position with fine silk and dressed in the ordinary way.

May 11. First change of dressing. Grafts look well, bluish in color. Only slight discharge in the gauze.

May 20. Thumb in good position. Grafts have held firmly.

May 26. Sent from hospital on account of whooping-cough.

September 16. The thumb was found to be in good position and has several degrees of voluntary motion, the hand was still slightly flexed on the forearm. A cicatricial band was therefore divided and a graft, 2 by 1 inch, inserted on the flexor side of the forearm. The scar tissue was also dissected off from the proximal interphalangeal joint of the ring finger and a graft,  $1\frac{1}{4}$  by 1 inch, inserted there.

October 10. These were entirely healed.

October 18. Little finger amputated, consent having been withheld before. After the healing of this wound she was treated by massage and her hand continually improved, but on January 5th, as there was considerable ulnar deflection of the hand, the cicatrix of that side of the wrist was incised, a part of it dissected away and a graft,  $1\frac{1}{2}$  by  $\frac{3}{4}$  inch, was inserted. This held well, and massage was again used, but on June 28th, as

there was still some ulnar deflection, another incision and dissection were made and a diamond-shaped graft, 2 by 1 inch, was inserted. This was well healed in place in five weeks and the patient sent home. The accompanying photographs were taken two and a half months later and show the deformity well corrected.

CASE III—E C, History No 1664, aged 12 years, July 26, 1904. Hand was burned when he was a small child and a contraction has followed. The terminal phalanx of the left index finger is drawn forward, almost to a right angle, and held by dense scar tissue. The middle and terminal phalanges of the little finger are flexed upon the proximal phalanx which in turn is held backward toward the dorsum of the hand by firm cicatricial bands (See photograph.)

Operation July 29th. Cicatricial tissue excised from flexor side of both fingers, deep tendon of index finger and superficial tendon of little finger lengthened. Grafts sewed in with catgut. Dressed in usual way.

First dressing changed August 6. Wound clean. Grafts look grayish-white.

August 20. Dressing changed. Grafts have taken, excepting small area at the end of the one on the little finger.

September 3. A slight granulating spot at margin of little finger graft.

October 8. Discharged cured.

November 8, 1905. Presented before New York Surgical Society. Hand useful and shows hardly any practical disability. Extension of both fingers almost normal. Flexion in both little and index fingers about  $\frac{2}{3}$  the normal. No voluntary motion in terminal joint of index finger. (See photographs.)

CASE IV—M C (History No 1965), aged four and one-quarter years. April 4, 1905. Three years ago (when sixteen months old) fell and cut palm of hand and base of index finger on glass. A contracture followed, which increased for a few months and has since been stationary (see photograph). The right index finger was found flexed at the proximal interphalangeal joint, and held by a firm cicatricial band which extended well into the palm. There were several degrees of motion at the metacarpo-phalangeal joint.

# PLATE III (CASE III)



FIGS 1 and 2 —Cicatricial Contractures of Index and Little Fingers of about ten years duration



FIGS 3, 4, and 5 —Photographs of Hand in Extension and Flexion one year after operation

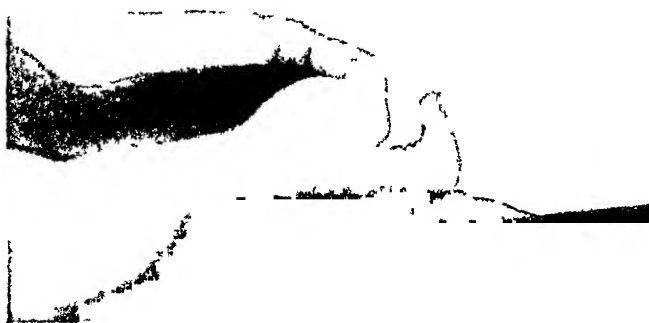


FIG. 1—Contracture of Index Finger of three years duration



FIGS. 2 and 3—Hand in Extension Flexion, six months after operation

April 6, 1905 Cicatricial tissue dissected out Just under the skin it was very firm and band-like An elliptical graft,  $1\frac{1}{4}$  by  $\frac{3}{4}$  inch in size, was stitched into the defect Nine days later dressing changed for first time, condition of graft good Seven days again dressed, doing well One month after operation graft of good color and firm Three weeks later discharged with graft firm and several degrees of motion in finger

Seen October 21, 1905 Finger held extended, no contracture (see photograph) She can flex it to a right angle, and when she does so the tendon can be felt in the palm and at the base of the finger It is, however, adherent in the proximal phalanx of the finger, and gives no independent motion in the distal and middle phalanges

CASE V—S C (History No 1838), aged seventeen years, congenital deformity of hands (See photograph)

February 16, 1905 Left little finger The very dense band of fibrous tissue, which resembled that of the other cases, was dissected away and the finger straightened A skin graft,  $2\frac{1}{2}$  by  $1\frac{1}{4}$  inches, was stitched into the defect and the usual dressing applied, with the finger in extension

February 27 First dressing, doing well

March 1 Second dressing, doing well

March 3 Third dressing Patient discharged from hospital, to be dressed by Dr George W Kosmak, who sent her there

May 18 This finger was found to be nearly straight, with slight flexion at the terminal joint, held in slight adduction, ten to fifteen degrees of motion in each joint

Operation May 18 on right little finger Operation similar to that on left side Two grafts were used, one kite-shaped, 2 by 1 inch, and one of irregular shape,  $\frac{1}{2}$  by  $\frac{1}{4}$  inch First dressing, eleven days later, graft dry and clean, position of finger good Patient referred to Dr Kosmak for further dressing Healing took place well No other operation was deemed advisable, excepting the removal of the terminal phalanx of one of the fingers The contractures were relieved and the healing of the grafts was satisfactory, but on account of the congenital defects, the resulting fingers were far from normal

CASE VI—J N (History No 2100), aged seven years

March 20, 1905 One year ago clothing caught fire and she was severely burned about the chest and left arm The areas about the upper arm and chest were covered partly by a flap taken from the side of chest, and partly by Thiersch grafts, but the elbow was held flexed at a right angle by contractures which had formed in the early process of healing (See photograph)

June 26, 1905 A transverse cut was made at the flexor surface of the elbow and the skin was loosened about its edge The arm was then extended The resulting defect, 2 by  $2\frac{1}{2}$  inches, was filled by a skin graft and dressed in the usual way It was dressed eight days later, the graft showing the ordinary pale bluish color for that period of healing One week later color good A slight necrotic spot developed in the centre of the graft and a small spot of granulation at its edge These were slow in healing as it was difficult to prevent the irritation of the forming scabs, even through the dressing

She was however discharged from the hospital five weeks later in good condition and with good power of extension in the arm

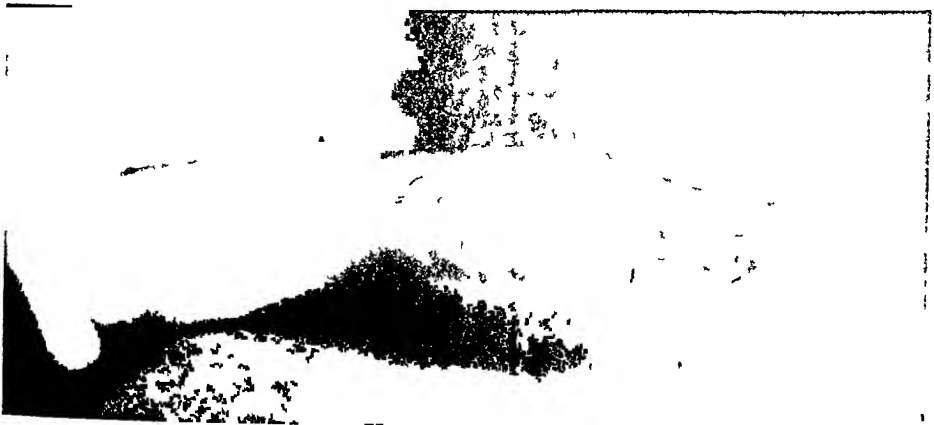
Seen four months after the operation slight keloid about the edge of the graft and in a spot in its centre, but the skin is of good quality and firm and motion in elbow is normal

In review we note that in the five traumatic cases the contractures were relieved and showed no tendency to recur after periods of, respectively, thirty-three, eighteen, fifteen, seven and four months from the times of the first operations In the congenital case only the little fingers were susceptible of treatment, and these were greatly benefited The left one, which was contracted backward so as to be not only useless, but an obstacle to the use of the hand, was changed to nearly a normal position, has several degrees of motion in each joint and is a useful member The right one has been released from its constriction and might well have good motion, but for the congenital malposition of the parts The grafts were all movable over the underlying tissues Sensation was present in them, in some instances minute hairs were growing in them, and the skin was almost normal There was a tendency to thick-

PLATE V ( CASE V )



FIGS 1 and 2 — Congenital Deformity of Hand



FIGS 3 and 4 — Little Finger in Extension and Flexion Eight months after operation



PLATE VI. (CASE VI )



FIG 1—Cicatricial Contracture of Elbow Flexion limited to about  $90^{\circ}$



FIG 2—Arm four months after operation, motion in Elbow normal

ened scar formation about their margins in varying degrees, and in one case this extended into the substance of the graft, but in no instance was this enough to interfere with the free use of the adjacent joint

The value of tendon lengthening also is of interest. It was done six times in this series. One deep flexor of ring finger at terminal joint. One extensor ossis metacarpi pollicis. One extensor prima internodii pollicis. One extensor secundi internodii pollicis. One deep flexor of index finger. One superficial flexor of little finger.

In the first case the resulting motion was practically normal. In the extensors of the thumb the resulting motion was about half the normal, limitation in extension being apparently due to a cicatricial band in the middle of the wrist and palm, which had not been sufficiently divided. The result for the superficial flexor of the little finger was apparently good, but it was difficult to distinguish the action of the deep and superficial tendons. In the last instance the lack of voluntary motion in the terminal joint indicated that the lengthened tendon was so adherent as to give no independent motion.

These results are surely sufficiently good to warrant the further trial of these two elements in relieving these contractures. They are surely much better than the author has seen from other methods.

In estimating the value of the procedure, we must manifestly consider the difficulty in securing union in the grafts. This difficulty has been sufficient to make the "entire skin" method of grafting unpopular. With the small grafts which are usually needed for contractures, however, and the clean surface which can be obtained, there is little difficulty in obtaining union. In this series every graft held well. If we include in the series a failure of a graft in a contracted ankle, where an ulcer was present and the tissues were very poorly nourished we still have ninety-three per cent of successes. Operation for these cicatricial contractures can almost always be done in well nourished tissues, and without the presence of ulceration, and we may confidently expect the graft to hold in almost every instance.

*Technique* — There are some points about the technique which are important. Aseptic operation without the use of germicidal solutions is desirable, also hæmostasis, when possible by pressure, without the use of ligatures. The grafts may be held in position by small silk stitches, although Krause considers this unnecessary.

The method of dressing has varied greatly with different operators. Kennedy in one instance left the first dressing of sterilized gauze in place five weeks, healing being complete on its removal. Wolfe, whose operations were on the face, usually changed the first dressing on the third day and then made daily dressings. Krause changes his first dressing in three or four days and dressed the wounds again every two or three days, soaking off the gauze with boracic acid solution immersing the entire member in the solution for about an hour. Of course the method must differ somewhat with the case. Cleanliness and fixation are the two desired conditions. If there is doubt about the former, the dressing would be changed oftener than if asepsis is assured. The nourishment of the graft takes place by effusion at first, and then minute vessels have been observed running into the graft itself, in some instances communicating with those vessels which already existed there. It is important that the grafts should not be moved, as these vessels are of course very delicate indeed. It is difficult to avoid moving the grafts in changing the dressing, and therefore great care must be used. In the cases here reported rubber tissue has been put over the graft and allowed to extend about a quarter of an inch beyond its margin on all sides. Moist gauze has been placed above this, which is also protected by rubber tissue to prevent its too rapid drying, and this has been enveloped in dry sterile gauze. The part has usually been put in plaster, and the first dressing has been done eight to fourteen days later. If there is a purulent discharge, it can quickly be told by the odor, a part of the gauze being left uncovered by the plaster for this purpose. The first rubber tissue is usually not changed at the first dressing, if changed it has been replaced by a similar one. One can easily appreciate the advantage of Krause's method, which consists in soaking

the entire member for an hour in boracic acid solution until the gauze is entirely loosened from the graft, but many of these contractures occur in children, and it would be practically impossible to follow this method with them without having the graft injured

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- <sup>1</sup> Brit Med Jour September 1875, p 360
- <sup>2</sup> Archiv f klin Chir, 93, xlv1, p 177-182
- <sup>3</sup> Henle and Wagner Beitrag zur klin Chir Bd xxiv, Hft 1
- <sup>4</sup> Widman Beitrag zur klin Chir, Bd xxxvi, p 579-1902
- <sup>5</sup> Kennedy Glasgow Hospital Reports, 1899
- <sup>6</sup> Hibbs Med News, April 21, 1900

of indirect violence said that he had tripped and fallen, receiving the impact of the fall upon the tip of the thumb, held at the time in extension. This produced a fracture at the middle of the shaft. Lonsdale has recorded a case in which fracture of the third metacarpal was caused by a fall upon the end of the outstretched middle finger. The cases of direct violence have resulted from falls upon the back of the outstretched hand caused by slipping on the pavement, or falls from a height, as a wagon or street car. In two cases the injury was caused by blows delivered across the back of the hand, one being a fracture of the first, the other a fracture of the fourth metacarpal.

The first metacarpal bone may be broken at any place in its length. I have found the diagnosis of these fractures extremely difficult in some cases on account of the extensive effusion occurring into the flexor tendon sheath. Two of my cases are especially interesting, as they are good examples of the so-called Bennett's fracture or stave of the thumb (*British Medical Journal*, July, 1886). This is an oblique fracture at the base of the first metacarpal bone. Bennett obtained six museum specimens which showed this deformity. From these he was led to conclude that the fracture was a very common one, and he believed was often mistaken for partial luxation of the metacarpal bone of the thumb. The eighteen years, however, which have followed the publication of Bennett's article have proved his conclusions to be erroneous. The fracture is rare. I have found since Bennett's article but two cases reported in the literature, one by Roberts, of Philadelphia, reporting a case of Dr. G. T. Beatson, of Glasgow, Scotland (*Philadelphia Medical Journal*, March, 1901), the other by Prichard, referred to in von Bergmann's "Surgery."

The history of my first case is as follows:

J. B., a railroad engineer, aged forty-one years, while adjusting the headlight on his engine, slipped and fell. He remained unconscious twenty-five minutes. He resumed work soon after

the accident, but his left hand was very painful. Eight hours later, when he reached the city, his glove had to be cut off. The whole hand was much swollen. Careful palpation of the metacarpal and phalangeal bones revealed no fracture. The hand was treated as a simple contusion and hot applications made. One month later the patient again reported. The thumb was still very painful, especially when adduction was attempted. The patient had not been able to resume work since the receipt of the injury. The maximum tenderness was at the base of the first metacarpal bone. There was considerable fluid in the flexor tendon sheath. Outside of the thenar eminence there was little swelling. The bone was fractured in two places, obliquely just below the articulation and longitudinally running into the joint between the metacarpal bone and the trapezium. The thumb was put up in abduction, being held in this position by an internal rectangular card-board splint. One month later the joint was somewhat stiff, but the patient had been able to resume work.

The following is the history of the second case of Bennett's fracture which I have seen.

T. D., aged twenty-seven years, an oiler by occupation, took part in a street fight two days before he presented himself to me. He reported that he struck a heavy blow with his left fist tightly clinched, the force being received on the head of the first metacarpal. He went immediately to the City Receiving Hospital, where a diagnosis of backward dislocation of the first metacarpal was made and a pasteboard splint applied. On examination, I found great swelling over the thenar eminence. Posteriorly, there was a prominence at the base of the first metacarpal. The thumb appeared slightly shortened. Profiting by my first case, I succeeded in eliciting crepitus at the metacarpal base. The radiograph (Fig. 1) was then taken. It shows a displacement of the distal fragment upward. A slate-pencil coaptation traction splint, to be presently described, was then applied, and this reinforced by a rectangular card-board splint. Function was restored at the end of three weeks.

The displacement in this case was similar to that present in the one reported by Roberts. There was no displacement noted in my first case. The injury is probably caused by a blow upon the tip of the thumb, held at the time in extension, or upon the head of the metacarpal, the fist being clinched. The case cited by Bennett is instructive. A young man, while horseback riding, was thrown violently forward, the tip of the thumb being dashed against the pommel of the saddle.

Through the kindness of Dr. Harry M. Sherman, I have seen a case of spiral fracture of the fourth metacarpal occurring in a woman. This woman was an asylum nurse. The fracture resulted from the corresponding finger being twisted by an insane patient.

Fractures through the metacarpal heads are uncommon. The following case is of interest on account of its rarity and the facility with which reduction was maintained.

P. C., aged twenty-seven years, a longshoreman by occupation, while alighting from a street-car was thrown, violently striking upon the back of his right hand. When he presented himself at the clinic the next day, there was considerable swelling over the second metacarpal-phalangeal joint, the knuckle being greatly depressed. The first phalanx was found to be intact, but its base had sunk on to the dorsum of the hand, resembling a dislocation. On palpation, crepitus was determined at the head of the second metacarpal. There was considerable displacement of the fragment. Fractures at this point are held with the greatest difficulty, and, as the fracture ran into the joint, the patient was told that, notwithstanding what might be done, he would probably have a stiff finger. Reduction was accomplished by means of forcible traction, and the following dressing was then applied. Slate-pencils were placed as coaptation splints on each side of the broken metacarpal, two in the palm and two on the back of the hand. These extended from the metacarpal base to the middle of the shaft of the first phalanx. The slate-pencils were firmly secured in position by means of two narrow strips of adhesive plaster passed about the hand.

Small rubber bands were then placed over the projecting ends of each pair of slate-pencils so that they would press quite deeply into the interosseous spaces. The dressing was then completed by making traction forcibly upon the finger, and maintaining this traction by means of an adhesive strip wrapped firmly about the finger and the projecting ends of the four slate-pencils. Cotton was then placed between the fingers and about the tips of the slate-pencils to prevent rubbing, and the dressing completed by a posterior splint of wood (Fig 2)

On inspecting the hand three days later, I found that the dressing had held remarkably well, nor did the patient complain of it. Although it had been necessary to apply it quite tightly, there had been no interference with the circulation. The dressing was then removed. Seven days after the dressing was applied, the hand was again examined. I was surprised to find that the patient had complete range of motion of the index-finger, and that the affected knuckle was as prominent as the corresponding one on the uninjured side.

This splint has been used with excellent results for all fractures about the heads or distal portions of the shafts of the metacarpal bones. By its use accurate approximation has been obtained, and the callous, deformities and shortening, so common in these fractures, avoided. Traction, difficult to obtain on account of the laxity of the metacarpo-phalangeal joint, has been more satisfactory in this method than in the older modes of treatment which have been previously employed. Small lead-pencils may be used with equal facility. Some slate-pencils are too brittle to be of service. The dressing is applied with considerable difficulty to the second metacarpal, but is easily applied to the third and fourth. For the first and fifth metacarpals the dressing is modified by employing two pencils placed in the interosseous space and one pencil applied laterally. Dressings of the thumb should be reinforced by the internal rectangular splint. In all these dressings a posterior splint of wood or card-board is an additional safeguard.

The dressing recommended by Carl Beck (*New York Medical Journal*, August, 1900) has also been used with good results in cases where traction was not necessary. This consists of a co-



aptation splint made of short pieces of drainage-tube of moderate size applied on each side of the fractured bone on the dorsum of the hand and held in place by strips of adhesive plaster. The old dressing—a roller bandage placed in the palm of the hand, the fingers being drawn down firmly over it—has been employed in a number of cases in this series, but has not given uniformly good results. Traction in this method is very unsatisfactory. The pressure exerted is unequal, and posterior bowing of the fractured metacarpal has occurred. Fractures of the second and fifth metacarpals are very inadequately protected by this method, and no attempt is made to correct lateral deformity.

I have operated for malunion and painful callus in one case in this series. This was a man aged thirty years, a cabinet-maker and a musician. He had fractured his fifth metacarpal, right hand, while striking a punching-machine. He was attended by a physician at the time, but the lesion was unrecognized. When he applied to me one month later, there was a large amount of exuberant callus over the lesion, there was considerable shortening, and movements of the finger were very painful. He had been unable to follow his trade or pursue his musical studies since the accident. Under anaesthesia, an incision was made on the dorsal surface over the fifth metacarpal, the exuberant callus chiselled away, and the bone refractured. The operative wound was then closed and the finger placed on a wooden extension splint, the coaptation dressing of Beck being also employed. The patient had free use of his finger three weeks after the operation. The end result is shown in the radiograph (Fig 3). There is slight lateral deformity and some thickening over the bone, but the knuckle is prominent. The range of motion is perfect.

The diagnosis of metacarpal fractures presents few difficulties. All the bones are easily palpable, and in fresh cases crepitus can generally be ascertained. For obtaining crepitus, the method recommended by Scudder is useful. "Grasp the finger corresponding to the fractured metacarpal with the whole right hand, steadying the injured metacarpal with the left hand, and make steady and continuous traction." This method serves admirably also for reduction. The fracture heals very rapidly, and for this reason early motion is advisable.

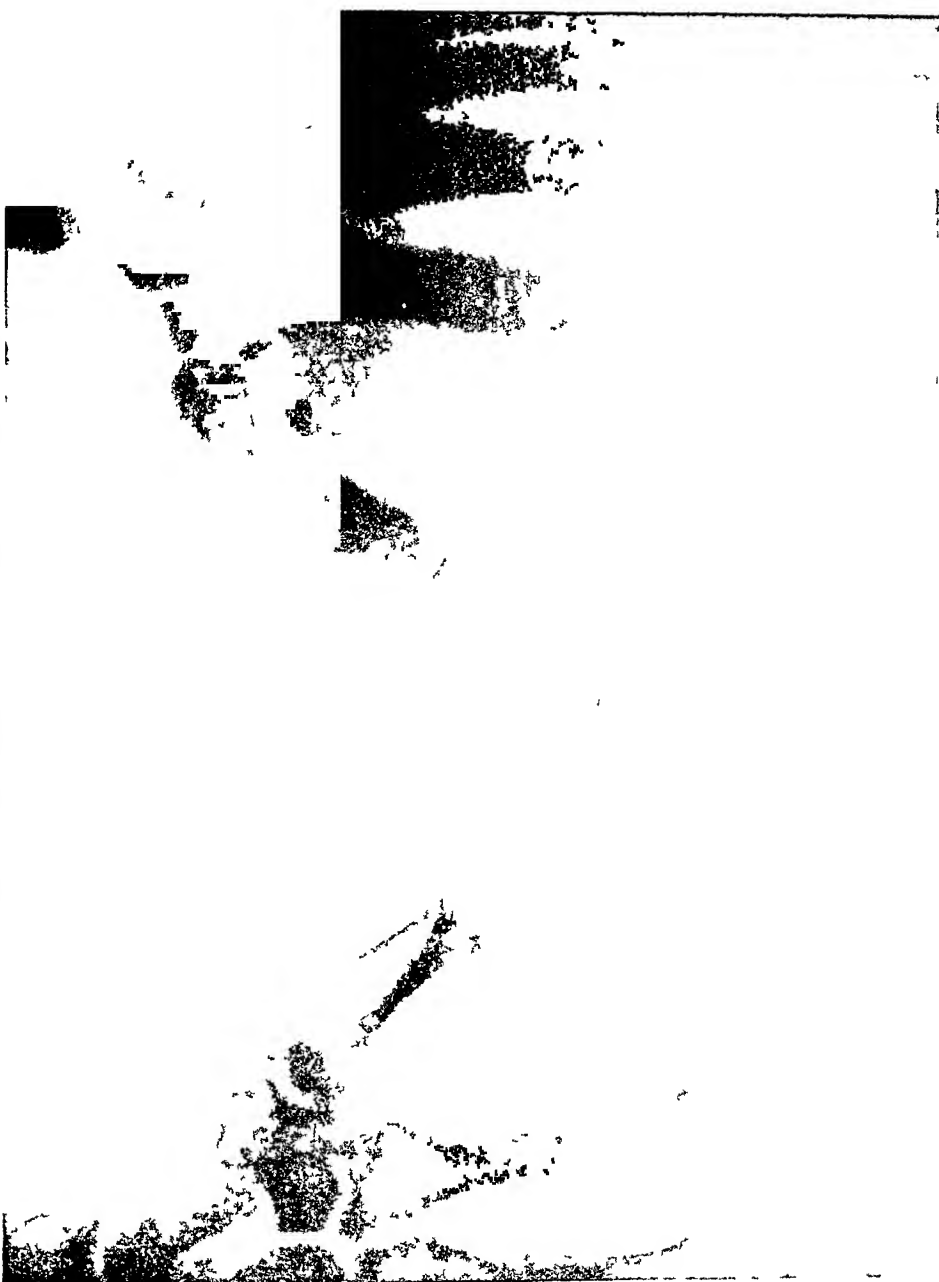


FIG 1.—Bennett's fracture or slice of the thumb (Case II)



FIG 2—Dorsal view of coraptation and traction splint of slate pencils applied to a fracture of the third metatarsal



FIG 3 —End result in operation on fifth metacarpal for malunion and painful callus





Bennett's Procture Case IV



# FRACTURE OF THE ASTRAGALUS WITH SUB- ASTRAGALOID FORWARD DISLOCATION OF THE FOOT REMOVAL OF THE ENTIRE ASTRAGALUS

BY C O THIENHAUS, M D,

OF MILWAUKEE, WIS

MR F, a Finlander, thirty-seven years old, from Ishpeming, Mich, a miner by occupation, seen in consultation with Dr B, in Ishpeming, gave the following history

Four months ago, while working in a mine, he fell backwards from a height, a number of rocks falling with him. He landed on his feet and after being extricated from the rocks it was found that his left ankle was swollen considerably and the foot dislocated forwards. An immediate attempt was made to reduce the dislocation under narcosis, but it proved unsuccessful, and as an insurance company paid for him while unable to work, he would not permit a bloody reduction immediately.

When I saw him four months later the following status presented itself. The ankle joint of his left leg was partially ankylosed. The left foot, on which he was unable to step, was standing in a decided varus position and seemed largely elongated. Taking measurement from the external malleolus to the os calcis, the distance was approximately 1 to  $1\frac{1}{2}$  cm on the injured foot, while on the healthy foot the same distance was 3 cm. The distance measured from the inner malleolus to the tip of the great toe was greater on the injured than on the healthy foot. I advised taking a Rontgen-ray picture from three directions, to clear up the diagnosis, and found the conditions as demonstrated in the accompanying plates.

Number 1 was taken in an antero-posterior direction and showed the fracture of the external malleolus. Nos 2 and 3 were taken from the inner and outer side respectively and demonstrated that we had to deal with a fracture of the astragalus and subastragaloid forward dislocation of the foot. As four



months had elapsed since the date of the accident, I did not take the bloody reduction into consideration, but advised the removal of either a part or the entire astragalus, to overcome the deformity and to make the foot useful

I used an incision extending from 6 cm above the external malleolus down parallel to its posterior border to the tip of the external malleolus, from there in a curved direction to the middle of the foot on its dorsal side. As both peronei tendons were crossing the field of the incision and could not be retracted sufficiently to clear the field of operation, these were divided. Then the entire astragalus was removed with great difficulty, owing to the dense adhesions that had formed, the peronei tendons sutured and the wound partially closed and partially drained. A plaster-of-Paris cast was then applied with the foot standing in an overcorrected position.

Ten weeks after the operation he was able to walk about and four months later, when he did not receive any more money from the insurance company, the slight pain of which he still complained disappeared and he took up his difficult work as a miner again. A movable joint has formed between the external and internal malleolus and the os calcis.

The position in which the foot is standing now, is shown on Plate No 4.

*Epicrisis* — Subastragaloid dislocation of the foot is of rare occurrence and was first described by Nélaton in his "Surgical Pathology." The condition has been frequently mistaken for dislocation of the astragalus, and Broca was the first (1853) to show that subastragaloid dislocation must be strictly differentiated from dislocation of the astragalus. Deetz (Deutsche Zeitschr f Chirurgie, Vol 74, p 581) has recently collected all cases of subastragaloid dislocation of the foot, cited in the world's literature. To avoid unnecessary repetition I refer the reader to this article in regard to literature on this subject. Deetz found that subastragaloid dislocation to the inner side is most common, twenty-eight cases being reported. Twenty-five cases of subastragaloid dislocation to the outer side are reported in the literature, twelve cases of backward dislocation and only six cases of forward

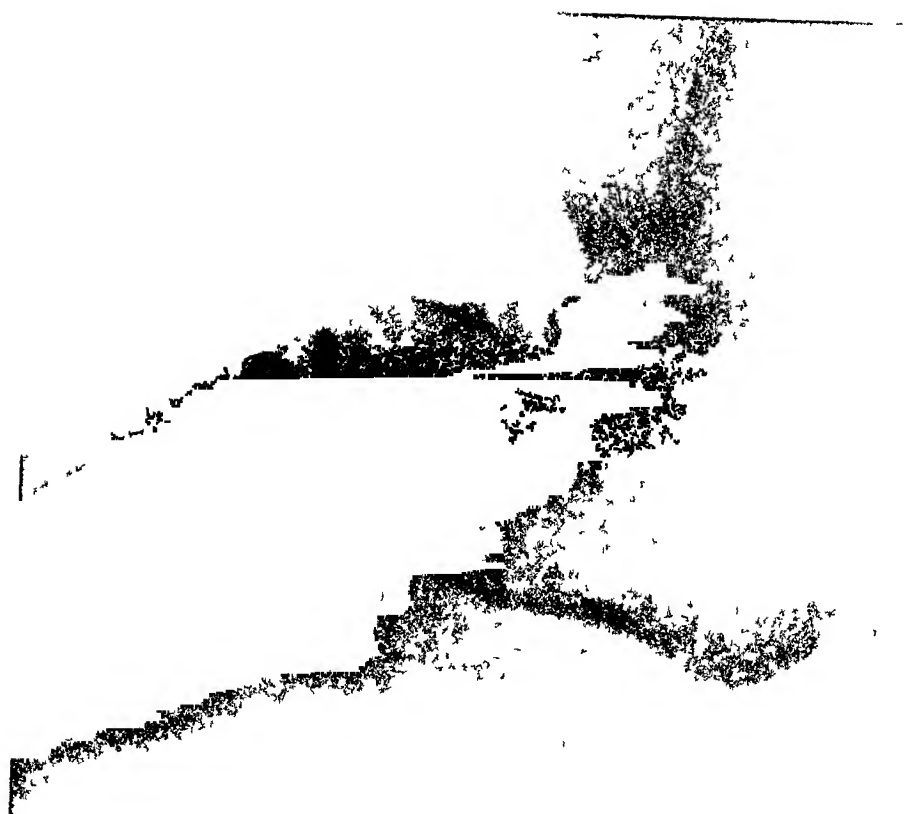


FIG. 1.—Fracture of Astragalus and Subastragloid. Forward dislocation of the foot.  
View from outer side. Op. 2, 3, 1924.



FIG. 2.—Fracture of Astragalus and Subastragaloid. Forward dislocation of foot.  
Results after removal of Astragalus.

dislocation of the foot, to which he adds a case of his own. From these last seven cases, three,—*a*, *b*, and *c*, those reported by Parise, Petit and Planteau, were simple cases of subastragaloid dislocation without fracture of the astragalus, while the four others reported by Guenzerich, Sick, Mailland and Deetz, were complicated by a fracture of the astragalus. My case therefore would be the fifth case of subastragaloid forward dislocation of the foot with fracture of the astragalus, and is furthermore complicated by a fracture of the external malleolus.

That fractures of one or both malleoli are not so seldom complicated by partial or total fractures of the astragalus, has been proven since the enlightening of the dark field of fractures by the Röntgen ray.

In but one case of the seven cases of subastragaloid forward dislocation of the foot it was necessary, as in my case, to resect the entire astragalus because of the long standing of the deformity. This case (operated on by Kuester) is cited by Guenzerich, already mentioned above. The deformity existed, in this case, six months before the patient entered the hospital.

In regard to the cause of subastragaloid forward dislocation of the foot, the patient in nearly all cases gives the following similar anamnesis:

The patient seeing that he is falling from an exposed height such as a ladder or rock, jumps to save himself, backwards, or sideways and backwards, then lands with his heels on the ground, tumbling over backwards or forwards, with the foot standing in dorsal flexion. In my case it was difficult to get any definite history, since the patient spoke the Finnish language only.

*Diagnosis*—The diagnosis is at times very difficult, due to the enormous swelling and intense pain in the ankle joint and surrounding parts. However, the lengthened dorsal aspect of the foot, so characteristic in all cases of subastragaloid forward dislocation, should always suggest the diagnosis, particularly if, as should be done, comparative measurements are made on the sound foot.

As the corpus of the astragalus is still in contact with the external and internal malleolus, some mobility in the ankle joint must naturally be present, providing the malleoli are not injured or fragments interposed at the same time

In our days, with the Rontgen ray at our disposal, it is not only desirable but absolutely necessary for a scientific diagnosis and treatment to have a Rontgenogram of the fracture taken from several directions

However as not every practitioner has easy access to a Rontgen-ray coil, the clinical symptoms of fractures ought by no means to be neglected in our teachings

*Treatment*—In recent cases of subastragaloid forward dislocation of the foot, reduction of the dislocation must be tried at once under anæsthesia and can usually be accomplished by strong dorsal flexion of the foot. If this does not bring about the reduction on account of the interposition of fragments or muscular tissue or parts of the capsule, the bloody reduction without or with the removal of the interposing fragments will usually be followed by excellent results

In cases of long standing, such as my case and the one cited by Guenzerich, nothing less than the entire removal of the astragalus is sufficient to overcome the mal-position of the foot, and, as the ultimate result in both cases has proven, may give excellent functional results, a new joint forming between the two malleoli and the os calcis

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, November 8, 1905*

The President, Dr. HOWARD LILIENTHAL, in the Chair

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### INTESTINAL OBSTRUCTION, FROM ADHERENT MECKEL'S DIVERTICULUM

DR CHARLES L GIBSON presented a boy, four years old, who was admitted to St Luke's Hospital on October 21, 1905, with a history dating back five days, when he was seized with sudden vomiting which soon became continuous. No cause for this could be assigned.

When Dr Gibson saw the boy he was in a condition of collapse, with a temperature of 99 F, and a pulse of 136. The abdomen was much distended. It was opened in the median line, and an obstruction of the lower portion of the ileum was found. The collapsed segment of the gut led to a Meckel's diverticulum, and upon investigation it was found that the obstruction was not caused by the diverticulum itself, but by an adhesion extending from the mesentery to the diverticulum. This was divided, and although the involved section of the gut seemed to be in pretty bad condition, the circulation gradually returned, and the boy made an uneventful recovery. The Meckel's diverticulum was about the size of the last joint of an adult finger, and was situated eight inches from the ileo-cæcal valve.

In reply to a question, Dr Gibson said he did not remove

the diverticulum, as it was not the direct cause of the obstruction, and as the child was apparently moribund at the time of the operation

DR CHARLES N DOWD asked whether any of the members had ever seen a case where a constriction of the intestine had resulted from the obliteration of Meckel's diverticulum? He had recently operated upon a case in which a constriction existed there. Whether it was temporary or not could not be determined, but it persisted during the half hour that the operation lasted.

DR ROBERT H M DAWBARN said he did not think the complication suggested by Dr Dowd was ever likely to occur. The diverticulum nearly always sprang from a section of the gut (the ileum) the contents of which, according to Murphy, were invariably fluid. In the large intestine, the contents of which were comparatively solid, obstruction was much more apt to occur. When the Murphy button was first brought out, the objection was made to it that the small opening it left would be apt to become obstructed, while as yet the button had not become detached, and in answer to that criticism, Dr Murphy published the results of a series of experiments and made the assertion that the contents of the small intestine were invariably fluid, and for that reason obstruction in that region of the bowel, need not be feared.

DR LILIENTHAL said that a few months ago he was called to see a girl six years old who had just recovered from the whooping-cough, during the course of which she had had attacks of abdominal pain. When the speaker saw her, she had been very sick for two days. The bowels had moved after castor oil. There was some abdominal distention. The temperature was not particularly high, and the child's parents were very much averse to operation. She was, however, sent to the hospital, and immediately after her admission she went into a state of collapse.

Upon opening the abdomen, which was done without delay, Dr Lilienthal said he came upon a Meckel's diverticulum about five inches long, and characteristic in appearance. It was turned under a fold of mesentery, and adherent somewhere in the right loin. The belly was full of bloody fluid, and the area of gangrene had extended up to the small intestine.

On account of the poor condition of the patient, nothing was

done but to draw the diverticulum into the wound, and make a quick entero-enterostomy with rubber ligature between the two legs of the involved loop. The patient died a few hours after the operation.

In this case, the speaker said, we had an organ much larger than the appendix completely gangrenous, and yet the symptoms were so mild until the child went into collapse that the advisability of an operation was doubtful.

### CARCINOMA OF THE MALE BREAST

DR. GIBSON presented a man, 67 years old, whose previous and family history was unimportant, with the exception of the fact that ever since he could remember he had a small lump in the left breast. Five years ago this had begun to increase in size, and a year later it began to ulcerate.

When the patient was admitted to the hospital, on October 2, of the present year, he presented a large, ulcerating mass firmly fixed to the chest wall. There was marked involvement of the axillary glands, and the outlook did not appear very hopeful. An operation was done, at which, in addition to separating the tumor from the chest wall, it became necessary to remove part of the intercostal muscles. The condition of the patient did not permit of immediate skin-grafting, and the wound was now healing by granulation.

Dr. Gibson said that this was the first case of carcinoma of the male breast upon which he had had occasion to operate. The case was also interesting because it illustrated the fact that benign tumors occasionally became malignant.

Pathological diagnosis. Alveolar carcinoma.

In reply to a question, Dr. Gibson said that he could offer no theory as to the origin of the cancer in this case. There was no history of irritation at the nipple, nothing but the tumor in the upper quadrant of the breast, and that had been there since childhood.

DR. LILIENTHAL said he had operated on one case of carcinoma of the male breast in which the patient distinctly traced the condition to the constant irritation of a suspender-buckle, which occasionally caused his nipple to bleed and which might have had some etiological bearing. That patient was a man



about thirty years old. He always wore soft flannel shirts, and the buckle of his suspenders rested right over the nipple.

DR ARTHUR L. FISK said that some years ago he saw a carpenter with carcinoma of the breast which was supposed to have been produced by the pressure of the stock of a bit against his left breast. The breast was excised.

DR DOWD mentioned a case in an actor who for a long time had played a part in which it was necessary for him to repeatedly strike himself on the breast with his fist.

DR LILIENTHAL called attention to the fact that these traumas may have only aggravated a pre-existing tumor.

DR FRIED KAMMERER said that he had operated on several cases of carcinoma of the male breast in which the disease proved to be of rather a malignant type.

#### EXCISION OF THE UPPER JAW

DR ORTO G. T. KILIANI presented a girl of twenty years, who developed a hard tumor of the right upper maxilla, which was first noticed about four years ago. The tumor gradually increased in size, and an operation for its removal was undertaken on October 16, 1905. Preliminary to the operation, the right external carotid artery was ligated, and the enlarged glands in the neck removed. He then made a resection according to Kocher, somewhat modified to prevent a disfiguring scar, and extirpated the entire upper right maxilla. There was no resulting facial paralysis, and the cosmetic effect was excellent, and would be further improved by the ultimate insertion of a proper plate. The pathologist reported that the tumor was a fibroma, and absolutely benign.

DR ROBERT H. M. DAWBARN said in approving of the external carotid ligation performed in this case, the New York Surgical Society had not put itself definitely on record in regard to the advisability of ligation of this artery as a preliminary step to certain otherwise very bloody operations on the face, and that even an excision of the upper jaw was resorted to by some operators without such a preliminary measure. In so prominent a work as "Butlin upon the Surgery of Malignant Growths," that author nowhere advocates preliminary ligations, and seemingly retains as many surgeons still do the fear of secondary hemor-

rhage from the external carotid, if tied, a fear based upon the close order in which its branches are given off—leaving no place for formation of an internal clot Dr Dawbarn said he had ligated the external carotid over one hundred times in living subjects, without encountering any secondary hemorrhages at all The subject had come up for discussion at the recent meeting of the Pennsylvania State Medical Association, at Scranton, and Dr Crile, of Cleveland, had made the statement that in a few instances sudden death had followed the operation, he did not say, however, that the cause of death in those cases was secondary hemorrhage Dr Dawbarn said, that in his opinion, ligation of this artery is, in experienced hands, practically without mortality, and that these were cases in which the internal carotid was tied by mistake He recalled such a case occurring at the New York City Hospital at his own hands, early in his experience, where the unintentional ligation of the internal carotid by himself in mistake for the external was followed within a few hours after the operation by coma and a rapidly developing lobar pneumonia, with death within two days This latter strange complication, the speaker said, he had subsequently learned was mentioned by Erichsen in his work upon surgery as an occasional ill-explained result of tying the internal carotid The only way in which this error could be avoided was to find, before tying, a perfectly frank bifurcation of the common carotid, *i e.*, one giving off branches in the neck, the other not doing so In the fatal case for which he had been responsible, Dr Dawbarn said, an inequality of the pupils was noticed shortly after the operation, and if recognizing promptly the significance of this striking fact, the wound had been immediately re-opened, and the ligature removed, which had been tied of course but gently about the internal carotid, the circulation in the brain might have been restored, and the patient's life probably have been saved

It seemed to the speaker well worth noting that the commonest anomaly in man, is the rule in dogs namely, that there is no external carotid, but, instead, the internal on its way to the brain gives off all the branches usually arising from the external carotid In such a case it is plain that although control of the seeming external carotid would stop the pulse over the facial and superficial temporal arteries this, the usual test given in the

text-books, would be valueless, might well cost the patient his life, and as a further blunder might easily be recorded by the operator as a death in consequence of ligation of the external carotid

DR KAMMERER said the mistake of tying the internal instead of the external carotid, to which Dr Dawbarn had referred, could be avoided, and therefore did not count against the operation. The speaker said he had resorted to preliminary ligation of the external carotid in a number of operations on the upper jaws. In one instance, a temporary resection of both superior maxillæ (Kocher), he had tied both external carotids with excellent result.

DR LILIENTHAL called attention to the advisability of the surgeon calling in a dentist before operating on a case of this kind. If the dentist was given the opportunity of looking over the ground beforehand, he knew about what he had to do and could get his mechanical appliance pretty well under way, whereas if we waited too long, the fitting of a prosthetic apparatus might be attended with difficulty. The speaker said he had seen cases where the deformity left after removal of both upper maxillæ was absolutely uncorrectable.

DR KILIANI in closing, said that his patient had for a time after the operation complained of a severe unilateral headache on the side where the external carotid was ligated. It had eventually disappeared entirely. In reply to Dr Lilienthal's suggestion, Dr Kiliani said that a dentist had been called in to see the patient before the operation, but he had offered no suggestions, and said he would do nothing until the jaw had been removed.

#### THE VALUE OF WOLFE GRAFTS AND TENDON-LENGTHENING IN THE TREATMENT OF CICATRICIAL CONTRACTURES

DR CHARLES N DOWD presented a paper with the above title (for which see page 278)

IN connection with his paper, Dr Dowd presented two patients upon whom he had operated by the method described. The history of these cases was contained in his paper.

DR DAWBARN said he wished to emphasize the following points in reference to tendon-work only. In splicing ten-

dons, he thought it advisable to remove as much of the sheath as possible. Excepting right at the fold of the finger, where a short portion must be left, the sheath elsewhere was the enemy of the surgeon, and with its free removal there was less plastic exudate to deal with—less gluing fast by teno-synovitis. The use of Johnson & Johnson non-adhesive gold-beater's skin court-plaster to prevent adhesions between the tendons—as first recommended by Dr Robert Morris. The speaker mentioned two personal cases in which there was sloughing of one of the tendons of the finger not far from its insertion (in one of them for a distance of nearly two inches), and in order to get a satisfactory result he had cut into the wrist high up, near the muscular juncture, and then, after finding the right tendon, it was severed extremely obliquely, so as to make a very long splice, and seizing its end in the other wound (that in the finger) it was drawn down until it came in contact with its opponent on the opposite side (i.e., toward the finger-end) to which it was united by suturing. So far as the speaker was aware this plan has not elsewhere been employed.

Dr Dawbarn said that in two cases of tendon-grafting, he had used tendons obtained from the leg of a cat. One proved successful, the other was a complete failure, the graft, about an inch long in both instances, having sloughed, in this second trial. However, as tendon is nourished only by vitalized plasma, and not directly by vessels of its own, such heteroplastic grafts deserve a better trial than they have heretofore received.

DR LILIENTHAL said that in his own experience with these cases he had found that the success of the operation depended largely upon the complete excision of all the cicatricial tissue, followed by the application of Thiersch grafts of considerable thickness, but not through the full thickness of the skin. He recalled two cases, one of cicatricial contracture of the axilla and the other of the elbow, following burns, in both of which the parts were firmly bound down. In each case he excised the scar completely, until the motions of the limb were perfectly free, and then, after applying grafts by the ordinary Thiersch method, the arm was put up in the extended position, and in both instances he obtained a perfect result. The Thiersch grafts employed for

this purpose should not be of the very thinnest kind, nor should they include the full thickness of the skin, as the Wolfe graft did. The removal of the cicatricial tissue should be by thorough excision, simply denuding the surface or scraping away the granulations would not be satisfactory.

DR KILIANI said that in the case of the child with the contracture of the elbow shown by Dr Dowd he would be interested to learn how the Thiersch grafts behaved after two years had elapsed. Fifteen years ago, in the case of a severe burn on the inner surface of the arm, he had applied skin-grafts by the Thiersch method, and within four months the grafts had shriveled up to such a degree that they were removed without difficulty, while at the same time the sound skin had stretched to such an extent that its edges could be brought together. The speaker called attention to the fact that the skin-grafts contained no elastic fibres, and on that account shrinkage occurred.

DR DOWD, in closing, said he had seen very annoying shrinkage occur in Thiersch skin-grafts, and for that reason thought it better to employ grafts of greater thickness. Kennedy's case, above referred to, is an important illustration of the relative value of the two varieties of grafts. He had employed the Thiersch and the Wolfe grafts side by side; marked contracture occurred in the former, but not in the latter. He believed that in the majority of cases of cicatricial contractures about joints the Wolfe grafts were much better than the Thiersch.

#### THE VITALITY OF RUBBER, WITH A NEW DEVICE REGARDING ITS LONGEVITY

DR DAWBARN said that he had investigated this subject, which was of some moment to the surgeon, and he had been informed by dealers that one of the best methods of preserving rubber articles was to keep them immersed in water. Of course, grease of any sort is fatal to rubber, as every one knows. Exposure to air, and quiescence, too, resulted in commencing crystallization, which was the beginning of the death of rubber. Many years ago, Dr Gerster had informed him that in order to prolong the life of his rubber tourniquet, whenever he opened the closet where it was kept he took occasion to give it a good stretching. All bicycle-repair men advise, too, that a rubber tire should be

kept pumped up as hard as possible during the winter months of the bicycle's disuse, and that persistent deflation soon results in a rotten tire

Obviously, maintenance of a persistent slight pull, to keep a rubber tube "awake," is better than semi-occasional stretchings at irregular intervals. And the object of these remarks was to show to the Society a pair of clamps, obtained from Ermold & Co., in this city, by which without cutting into the rubber the two ends of the large tubing we use for cording limbs are seized. One of these clamps is caught over a nail high in the closet, the other at the lower end, has a light weight attached to it. Thus the tubing is always subject to some little degree of tension.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting held November 6, 1905*

The President, HENRY R. WHARTON, M D, in the Chair

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### SARCOMA OF THE BREAST IN A GIRL OF ELEVEN YEARS

DR WILLIAM L. RODMAN presented a girl of eleven years upon whom he had operated for sarcoma of the breast. Through an unaccountable oversight the specimen was thrown away by the clinic attendants and hence a microscopic examination could not be made, but from the clinical history and the microscopic appearance of the specimen there seemed no doubt that it was a sarcoma. Certainly it was a neoplasm and was not encapsuled. Nearly a year ago the patient struck the breast, the injury being followed by pain. She was treated in the dispensary of the Jewish Hospital from Easter until September, the pain persisting and the growth increasing in size. When Dr. Rodman saw the patient, the growth was evident and was reasonably hard. Immediate removal was advised because the pain was increasing and also because of the large veins which ran across the tumor, he has never seen such veins in anything but a sarcoma. Three weeks ago the entire breast, including a large area of skin, was removed, the incision was carried well into the axilla but no enlarged glands were found. Sarcoma of the breast at any age is rare, there being ten or more carcinomas to one sarcoma. Dr. Rodman has not seen another case in so young a girl but recalls the reporting by Dr. Dugan, of Louisville, of a sarcoma in a girl of eight, and still younger have been observed, he had never before seen a neoplasm of any kind in so young a child.

## LAMINECTOMY FOR PARAPLEGIA THE RESULT OF TUBERCULOUS DISEASE OF THE SPINE

DR RICHARD H HARTE presented a man aged twenty-six, who was admitted to the Orthopædic Hospital on September 5, 1904. There was no tuberculous family history obtainable. He had suffered from pneumonia two years previous, had scarlet fever when five years old and diphtheria when seven. In 1896, when nineteen years old, he had typhoid fever which was complicated by phlebitis in both lower extremities, the right leg being the first affected. After three months of convalescence the leg ceased to swell. In 1898 he entered the army and in the course of his duties he fell and struck his left kneecap. The injury was not severe but there was much swelling and considerable pain. On June 29, 1898, he was admitted to the Pennsylvania Hospital under the care of the late Professor Ashhurst, with a diagnosis of tubercular disease of the left knee joint. Some iodoform emulsion was injected into the joint and a month later an abscess, apparently tuberculous in character, formed on the inner side of the right arm, this was opened and drained. Three months after his admission to the Pennsylvania Hospital the patient's knee condition improved and he left the institution walking on crutches. In the following May he returned to the hospital for examination and was under Dr Harte's care. His limb was in good condition and he had a fairly useful knee and was allowed the use of his leg. After this date he states the abscess in his arm opened again and the shoulder became stiff. Two years later he was readmitted to the Pennsylvania Hospital and the knee joint was found to be so badly diseased that palliative treatment was no longer considered, and the limb was amputated by Dr Hopkins in the lower third of the thigh, on October 23, 1901. The patient made a good recovery from the operation and returned to his home. Shortly after this he noticed a lump the size of a hickory nut on the lower dorsal region of the spine. He complained of pain in the lumbar region and was treated for lumbago. He was not seriously incommoded until June, 1904, when he began to suffer from what he described as "remittent fever." He was confined to bed for two weeks, and when able to be up noticed a numbness which he had felt for some months about his hips and which



increased so that his foot was numb, in a short time he entirely lost the use of his body and limbs below the waist line

He was admitted to the Orthopædic Hospital in September, 1904, paralyzed from the waist down. Sensation was markedly impaired throughout the affected area. He had incontinence of urine and feces and a very severe grade of cystitis. The stump of the amputated limb was in good condition. There was very marked kyphosis in the lower dorsal region. Every effort was made to relieve the annoyance due to the incontinence, extension was applied to head and right leg and the bladder thoroughly irrigated twice daily. After about two months of treatment the sensation improved and the incontinence and cystitis disappeared. At this time he was able, with effort, to slightly move the great toe. He remained in this state for about five months and no further improvement seemed probable, the question of laminectomy was then considered. He was examined by some of the neurological staff of the hospital, who advised against operation. Nevertheless, on April 27, 1905, nearly eight months after his admission to the Orthopædic Hospital, with his desire, laminectomy was undertaken, although a cure was not looked for. The spines and laminae of the ninth, tenth and eleventh dorsal vertebrae were removed, thus thoroughly exposing the cord so that it could be approached from all sides. Considerable extradural tuberculous material was removed and the anterior portion of the neural canal curetted and made as smooth as possible. Practically no shock attended the operation and on recovery from the anesthetic the patient expressed himself as being able to feel the bed beneath him in a much more natural way than before operation. He was put to bed with extension and counter-extension to the head and extremity. The wound convalescence was uninterrupted. Gradually increased power in the great toe was developed and at the end of four weeks sensation was perfect all over the lower extremities. The toes could be flexed, the ankle-joint, right knee and amputated left thigh could be moved at will, although markedly ataxic. On July 1, three months after operation, a plaster cast was applied. This was worn until about September 21, when it was replaced by a brace. Since that time his ability to walk has steadily increased, until now, seven months after operation, he is able to walk as well as the average one-

limbed person, although he is necessarily handicapped in the use of his crutches by the brace. The first of October he developed a small abscess in the right shoulder, which was evacuated and soon healed.

In this case it would seem that ample time had been allotted to treatment by rest, extension, etc., and that if this mode of treatment was to be pursued further valuable time would be lost and degenerative changes would soon be manifested in the cord, which would materially interfere with the results from any operative measure which might be determined on at a later period. Operative treatment in this class of cases is much more applicable in adults than in children. In the latter most brilliant results can be obtained by extension, pressure, etc., as the age, anatomical conditions, etc., lend themselves more readily to this mode of treatment. In adult cases it is Dr. Harte's judgment that after a reasonable period of rest and extension in bed, if no positive results manifest themselves after, say, from four to six months, more positive and radical measures should be considered. He was inclined to think that the paralysis and symptoms occurring in this class of cases are due in a great measure to tuberculous and inflammatory deposits, thickening of the membrane in and about the canal, and that their removal by a laminectomy will give a thorough exposure of the cord and its membranes, both anteriorly and posteriorly, and will thus offer the best means of relief. This procedure should be carried, if necessary, even to the severance of some of the spinal nerves so that the operator can be positive that no point of pressure has been overlooked. In a very small percentage of cases will any bony or angular compression of the cord be found. The region of the spine most prone to these affections would naturally be the dorsal, where the lumen of the canal is more restricted and where a small degree of thickening will be followed by pressure symptoms. It is a well-known clinical fact that many severe grades of paraplegia may recover though great angularity still exists, provided the tuberculous and inflammatory deposits are absorbed.

A number of years ago the brilliant results reported by McEwen, Horsley, and others led the profession to believe that almost every case of spinal carious paraplegia would be cured by operation. As a result many cases were operated upon with

disastrous results The operators failing to recognize that in addition to the local condition, their patients were afflicted with a weakening constitutional disease when the reactive condition was very low and where operative conditions were contraindicated

With regard to the operative technique Dr Harte had found that the best incision is one directly down on the top of the spinous process quickly separating the muscles and thoroughly exposing that portion of the column For a few minutes violent hemorrhage will result, but this is easily controlled by pressure After a thorough exposure of the laminae by removal of the spines with a large bone forceps a trephine can be applied and the neural canal thus carefully opened After the exposure of the cord the other parts of the canal can be easily removed with a pair of Rongeur forceps The trephine seems to be the simplest means of entering the neural canal, and after the removal of the disc the later steps of the operation are comparatively easy, little difficulty being experienced in exploring and examining the cord In closing the wound deep buried stitches of chromicized catgut should be employed, insuring accurate approximation of all the overlying tissues, thus doing away with any possible dead spaces for clots to collect in and favor suppuration The wound is preferably drained with gauze, as its contact with the cord is not liable to cause any undue pressure, which might possibly arise from the use of a drainage tube

DR DEFORREST WILLARD said the exceedingly favorable result obtained in this case by Dr Harte was undoubtedly due to the thoroughness of the operation, which extended both above and below the principal lesion, and also to the fact that he was able to remove so much tuberculous deposit If in these cases extensive pachymeningitis be present in addition to the deposit, operative benefits will not be so speedy or so satisfactory Striking cases like the one shown by Dr Harte were reported fifteen years ago by Macewen, Horsley and others and as a result the profession was deluded into thinking that all would give the same improvement Laminectomy is an excellent operation in favorable cases, in others it is a total failure and relapses are numerous In the case shown by Dr Harte relapse is not likely to occur unless the man again becomes tuberculous Dr Harte spoke of the care needed in selecting cases and of the feebleness of

certain patients contraindicating operation. A very good illustration of these statements is the case of a boy upon whom Dr. Willard operated recently who for twenty months had lain totally paralyzed from spinal caries. At last motion slowly returned in his legs but as the muscles had contracted so much that he could not bend his ankles, it was decided to divide the tendo-Achillis in order to allow more motion. This was done, the boy, roused from his ether, talked and seemed comfortable, then suddenly died in five minutes in spite of every effort made in his behalf. The result showed the poor general condition of the patient, death following so trivial an operation as division of tendons, with the loss of about three drops of blood and with an etherization of only a few minutes in a patient with no discoverable renal or cardiac disease. These are cases that die after laminectomy.

DR JAMES K. YOUNG said that Dr. Harte had very carefully selected his case in this instance, and hence had met with success.

The difficulty in selecting cases lies in the recognition of the pathological process which is present in an individual case. Only 2 per cent of paraplegias are due to bone pressure and 25 per cent to tuberculous masses, the majority being caused by pachymeningitis. These patients should be operated on early, and they are in England, but not early enough here, especially by orthopedic surgeons. The operation is often delayed until complete loss of sensation has existed for a long period, and until every other known means of treatment has been exhausted. Often they are allowed to continue without operation more than four or six months. Early spasticity and early contractures are indications for early laminectomy, no other symptoms being so urgent. In all cases where it is possible the anterior portion of the spinal canal should be carefully examined. The removal of tuberculous masses from the anterior portion of the cord is difficult and it is only in adults that it can be accomplished. The incision employed by Dr. Harte is the best of the various ones in use.

#### TWENTY-ONE GUNSHOT PERFORATIONS OF THE SMALL INTESTINES WITH RECOVERY

DR WILLIAM L. RODMAN reported this case, showing a specimen of six inches of jejunum containing three large perforations which was resected.

## THE TREATMENT OF PERFORATIVE PERITONITIS

DR ROBERT G LeCONTE read a paper with the above title (for which see page 231)

DR JOHN H GIBBON said that the method described in Dr LeConte's paper was a direct opposite of that advocated by many surgeons, in which the entire peritoneal cavity is thoroughly flushed and all of the lymph removed from the intestines. It is thought that many cases are lost because surgeons do not adhere strictly to either of these methods, that, is either a half-hearted irrigation is done, or else in trying to follow the Murphy plan too much is done. Murphy not only places these patients in the Fowler position after operation but has them brought to the hospital and placed upon the operating table in this same position. Dr Gibbon stated that he had failed to introduce the large quantities of salt solution which Murphy recommended. He has employed the method in other respects in five or six cases with most satisfactory results. He lost one case treated in this way a few days ago but believes that the patient died from a pulmonary embolus. Since reading Murphy's first paper two years ago Dr Gibbon has used much larger quantities of salt solution but states that after every abdominal section which he has ever done he has used either plain water or salt solution in the bowel. He learned this from Baer, who advocated it strongly fifteen years ago. Dr Gibbon strongly urged the employment of the Ochsner treatment *after* the removal of the appendix, he believes that frequently cases die from a spreading peritonitis the result of an active peristalsis. He always gives his abdominal cases morphia before they come out of ether, this he also learned from Baer, and has employed it in every case. The patients are much quieter during their recovery from the anesthetic and are much more comfortable. Many of the cases require but the one dose of morphia. If, however, the patients are restless, and if peristalsis is to be avoided the morphia is repeated.

Dr Gibbon is now watching four cases of diffuse peritonitis treated after the plan of Murphy, with the exception that the enemata of salt solution were not so large, and in which not a single suture was introduced in the wound. Incision was made through the right rectus. Three of these patients are entirely well and show no evidence of a hernia. Where no sutures are

introduced it is believed that the rectus incision is a much safer one than those which are more nearly over the appendix region. Another exception to the Murphy technique which Dr Gibbon made in all of his cases is that of gauze drainage instead of tube drainage. He is careful to carry a large gauze drain back of the bladder, another to the right iliac fossa and a third into the right kidney pouch.

DR RICHARD H HARTE said that there were two classes of cases with which the surgeon is constantly coming in contact. First, where the infection is diffuse and very acute and which when opened and drained invariably do well, second, those in which a similar condition has remained from twenty-four to forty-eight hours, during which time the toxic influences have been increasing enormously until the patient is profoundly poisoned, and his powers of resistance materially impaired. In the latter class when operated upon the prognosis is always exceedingly grave it being impossible to say just what amount of toxine these patients can stand. It is here that most of the failures are to be found. There is no doubting the fact that the method of Murphy, as emphasized by Dr Le Conte, of keeping the bowel full of water, is an exceedingly good one, and its employment often decides between failure and success in the treatment of these cases. For many years Dr Harte has pursued practically this method of treatment and has long appreciated the good results which come from it. He also is thoroughly convinced of the importance of keeping food away from patients after operation, as the too early ingestion of food is bound to be followed by fermentation, distention, etc., thus adding materially to the discomfort of the patient.

DR LE CONTE, in closing, said in reply to Dr W Joseph Hearn, who asked him to report the results of the Murphy treatment in cases of peritonitis of several days' duration, that persons are usually dead that length of time after perforation and he does not see them. If they do live for days, adhesions are generally found enclosing pus in pockets and these adhesions need to be broken up. Where pus is free in the peritoneum the method of Murphy gives only the best possible chance of recovery. The operation lasts but a few minutes, the amount of fluid in the blood vessels is increased, which stimulates the heart, and above all, by

its introduction into the rectum, the fluid changes the current of the lymph stream and prevents absorption of septic products. If the patient be in the typhoid state, as was one of those reported by Dr LeConte, he believes much obnoxious material is passed out by the increased flow of urine from the kidneys. Usually only 12 to 15 ounces of urine are passed the first day after an abdominal operation, while in the case mentioned, 65 ounces were voided. This cannot be other than a great aid in eliminating toxic products. In answer to a question by Dr Taylor regarding the length of nozzle for introducing salt solution into the rectum, Dr LeConte said that two inches entrance was sufficient.

#### CANCER OF THE BREAST    CANCER OF THE CECUM

DR WILLIAM L. RODMAN exhibited these specimens. The first is interesting from a pathological and anatomical standpoint, as proving that the pectoral muscles should always be removed when operating for cancer of the breast. He has followed the teaching of Grossman and Ratler as regards the presence of glands between the two muscles, but had never before seen a clear demonstration of the truth of such statements. In the specimen are three enlarged glands between the two muscles, and none of them was seen or felt until the greater pectoral was removed. The glands all lay well below the upper edge of the pectoralis minor.

The specimen of cancer of the cecum was removed post-mortem from a man who had several months ago suffered from chronic intestinal obstruction. He was in a very bad condition when put upon the table, vomiting fecal matter and with a pulse beyond 130. The diagnosis of malignancy had been made some time before and it was quite clear that the only thing which could be done was an entero-anastomosis. When the abdomen was opened the diagnosis of carcinoma was evident, the growth appearing to have originated around the base of the appendix. Nodules of various sizes from a millet-seed to an olive were scattered over the intestines and mesentery. The small intestine was so greatly dilated as to look like the stomach, the cecum was collapsed. A lateral anastomosis between the ileum and the cecum was performed by the clamp method as employed by Moynihan in

gastro-enterostomy The relief from obstruction was complete, patient living three or four months entirely comfortable so far as the intestinal current was concerned, an opening three inches long was made between the small and large intestines There were no further symptoms of obstruction at any time during the life of the patient

DR ADDINELL HEWSON referred to a case operated upon last June in which he found between the pectoralis major and minor a single tumor the size of a duck egg It extended from the pectoralis minor backward to the vessels Both pectorals were removed Subsequent microscopic examination showed the tumor to be a cancer Concerning the anatomical relations of the part there are two chains of lymphatics, one to the breast proper, the other to the pectoral muscles themselves These two chains join before emptying into the general axillary chain of glands and the growth described was situated at the junction of the two chains Dr Hewson has never seen glands situated so high as are those shown by Dr Rodman In his own specimen the growth was directly in the middle of the pectoralis minor Pressure may have prevented it going higher, the mass from the outside appearing as large as a fist

As emphasizing the great distention which occurs in the gut in cases of cancer, Dr Hewson mentioned a case which came to the Oncologic Hospital after having been operated on elsewhere Through the operation wound in the left groin a soft rubber catheter could be passed to a point between the median line and the opposite groin

#### CHEWING GUM REMOVED FROM THE BLADDER

DR E H SITER showed this specimen, which had been in the bladder four days It was remarkable chiefly for the large amount of salts adherent to it The gum had been inserted in the penis to prevent nocturnal emissions

DR WILLIAM J TAYLOR recalled the fact that he reported to the Academy last year an instance of gum in the bladder, it having been inserted in the penis to stop a gonorrheal discharge This had become encrusted with salts and formed a large stone Perineal section failed to allow removal of the mass, which was finally secured through a suprapubic opening



# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting January 2, 1906*

JOHN B ROBERTS, M D , in the Chair

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### CARCINOMA OF TONGUE

DR W JOSLPH HEARN, at the request of Dr W W Keen for whom he had operated, presented a deaf and dumb Russian girl who nine months previous to the operation noticed on her tongue a nodule the size of a cherry She was for some months put on antisypilitic treatment being in two hospitals, although no history of syphilis could be obtained Under Dr Keen's care a section of the growth, which had become much larger, was removed and microscopic examination showed it to be an epithelioma The entire tongue was removed by the Regnoli-Billroth method, the incision extending from one angle of the jaw to the other and then down on either side to clear the neck of its glands Both lingual arteries were tied The tongue was held forward by the customary ligature in the anterior position and in addition two ligatures were inserted near the base to afford better control of that part of the organ The tongue was divided at its junction with the epiglottis This left a very short stump which at once fell back, raising a difficulty as to its disposal It was finally sewed to the remnants of the muscles of the mouth which were barely one-half inch long, the muscles being then included in a subcutaneous stitch under the jaw The patient

has done very well since the operation, gaining 23 pounds during the seven weeks. The pathologist's report on the removed tongue was again epithelioma.

DR JOHN H. GIBBON said this patient was under his care for some weeks at the Pennsylvania hospital. Dr. Stewart first saw her and was in doubt as to the nature of the growth on the tongue, that is whether it was syphilitic or malignant. Finally he thought she was not taking the prescribed treatment regularly and sent her to the hospital. There several surgeons saw her and among them there was difference of opinion regarding the nature of the growth. It involved the side of the tongue and the floor of the mouth, the edges being prominent and everted, and was covered by a nasty, greenish-colored slough. A small section of the growth was sent to the laboratory but the specimen was not satisfactory. The patient was put upon mixed treatment—potassium iodide in enormous doses and mercurialunction. At first there was marked improvement, the growth diminishing in size and the slough separating. The patient was very tolerant of the treatment, there being no evidence of mercurialization except incontinence of saliva and this condition she had, as do all persons with tumor of the mouth, before treatment was begun. The result of the mixed treatment convinced him that the growth was syphilitic and later Dr. Stewart reported that he had obtained a clear history of syphilitic infection. Improvement, however, soon was less marked and the patient finally became disgusted with her progress and left the hospital. The case is of peculiar interest to Dr. Gibbon. He doubts that antisyphilitic treatment would have cured the patient, the case being one of those occasional instances in which operation is necessary. In view of the impunity with which mixed treatment was given and of the undoubted history of syphilitic infection, he is inclined to doubt the character of the growth as announced later. In addition and of great value clinically is the fact that when improvement under treatment occurred and the patient was able to open the mouth ulceration of both anterior pillars of the puses could be seen. These ulcerations healed under the antisyphilitic treatment.

DR JAMES P HUTCHINSON said he saw the patient with Dr Gibbon but did not agree in the diagnosis, as he believed the growth to be malignant in character. He was not, however, sufficiently confident of its nature to urge operation and with the other surgeons agreed that mixed treatment should be given. His opinion regarding the malignancy of the growth was considerably shaken by the improvement under three weeks' medical treatment and also by the absence of indications of mercurialization except the salivation which was present before treatment was begun. He did not see the patient again although he heard of Dr Stewart's statement of an undoubted history of syphilitic infection.

DR HEARN, in closing, said it was well known how rarely cancer is engrafted on a syphilitic lesion but if there is one place in the body in which this does occur it is the tongue. He now has under his care a gentleman from whom he had to remove part of the tongue which was cancerous and he believes the lesion originally was due to syphilis. All the glands of the neck in the patient exhibited were enlarged, though the lesion may have been syphilitic. In answer to questions by Dr Gibbon, Dr Hearn said he thought there was yet some granulation tissue in the floor of the mouth, the patient has had no constitutional treatment since operation.

DR RICHARD H HARTE delivered the annual address for 1906, his theme being "The Life and Labors of Dr Philip Syng Physick."

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### ORBITAL ABSCESS

Early in the year 1901 an extensive orbital abscess developed consequent from abscess in cellular tissue of both eyelids. The abscess had opened spontaneously in the region of the upper tarsal fold, and discharged copiously a thick yellow pus. In order to preserve the integrity of the important tissues in the vicinity of the wound I cleansed the abscess cavity, using with Unani's eye syringe pure Dioxogen, after which I employed various agents to combat the supuration. Among those employed were Iodoform, Boracic Acid, Calendula, Lysozol, Carbolic Acid, absolute Alcohol, and Potassium Permanganate of Potash, finishing the process with a packing of gauze.

The patient was treated twice daily, and in a month's time there was but little if any improvement.

On one occasion Dioxogen was employed without any further treatment, and the improvement following the abandoning of all other dressings was very evident. From that time the case proceeded rapidly to a complete cure under injections of Dioxogen alone, the only evidence of the malady remaining is a slight scar on the side of the wound and mere suggestion of ptosis. The vision, fortunately, is perfect being at no stage of the disease seriously affected.—*A. C. Peterson, M.D.*, 135 Geary St., San Francisco, Cal.

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### THE BLOODLESS PHLEBOTOMIST

The "Bloodless Phlebotomist" for January contains the following instructive articles:

"Appendicitis as an Intoxic Inflammation," by Prof. Robert T. Morris, A.M., M.D., of New York, "The Early Diagnosis of Pulmonary Tuberculosis," by H. Edwin Lewis, M.D., of New York, "Phagedenic Ulcer," by J. Bonney, M.R.C.S., of Levenshstone, England.

We would recommend to any of our readers who have not received a copy of this issue that they write for one to the publishers at 57 N. 4th St., New York. We are informed that such requests will be acceded to.

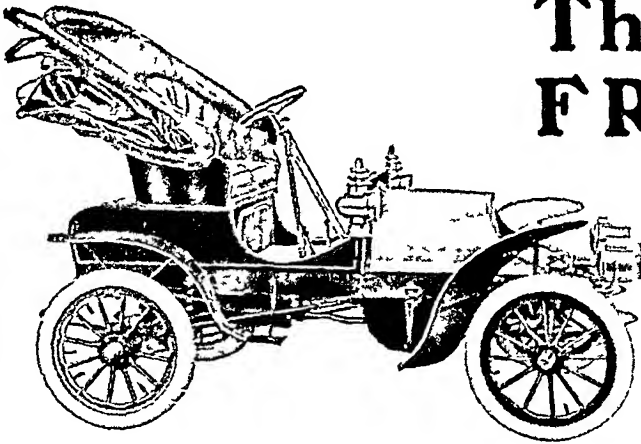
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Just at this season, when inflammatory affections of the respiratory organs are so prevalent, it is a matter of much importance to apply methods of treatment that will control the respiratory symptoms without deranging the other functions of the body. Expectorants fail so frequently that they are, to say the least, unreliable, cough syrups derange the stomach and thereby add a complication, respiratory sedatives, of which opium and its derivatives are the most frequently employed, depress the central nervous system and have but a transient palliative effect from which an undesirable reaction nearly always results. How much better it is to hold the respiratory symptoms in abeyance with a remedy which not only is absolutely free from deleterious influences, but has also pronounced constitutional effects, which reinforce its specific action on the respiratory tract.

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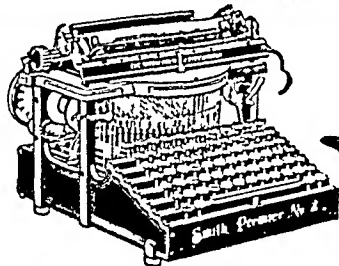
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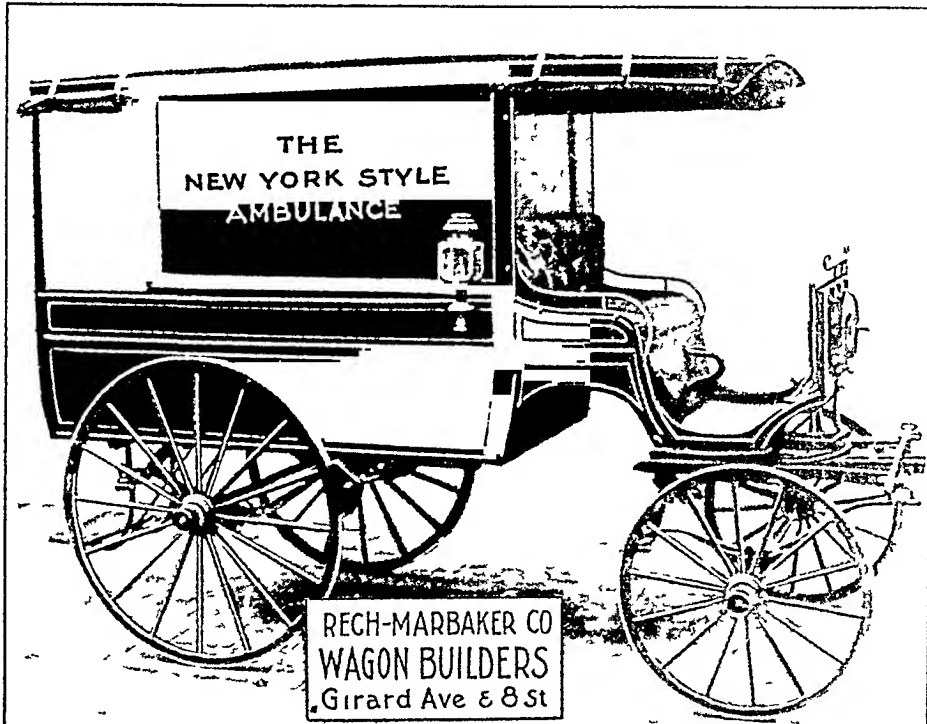
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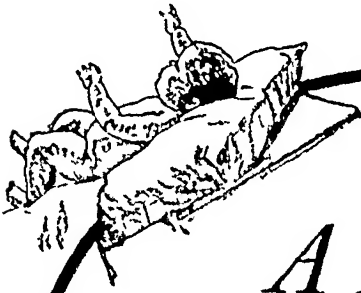
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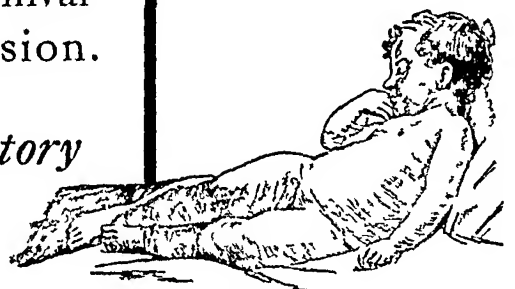
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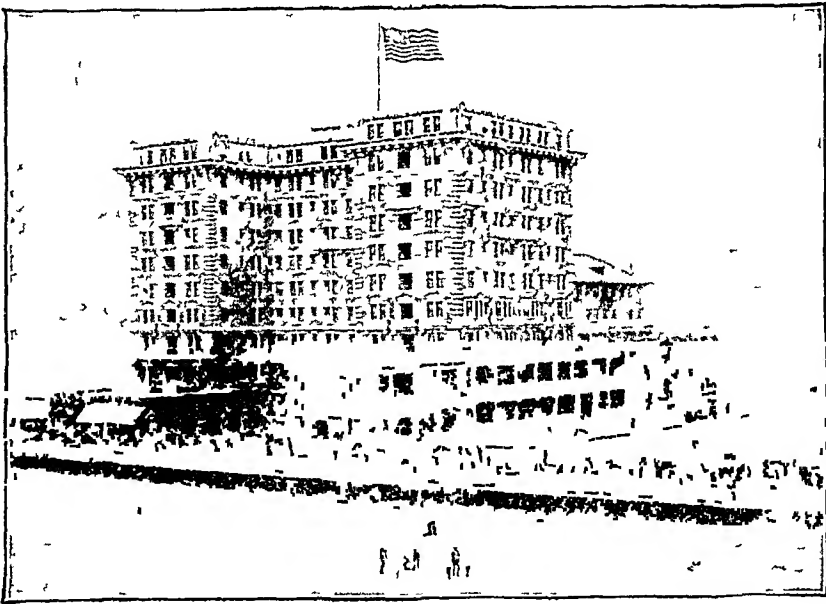
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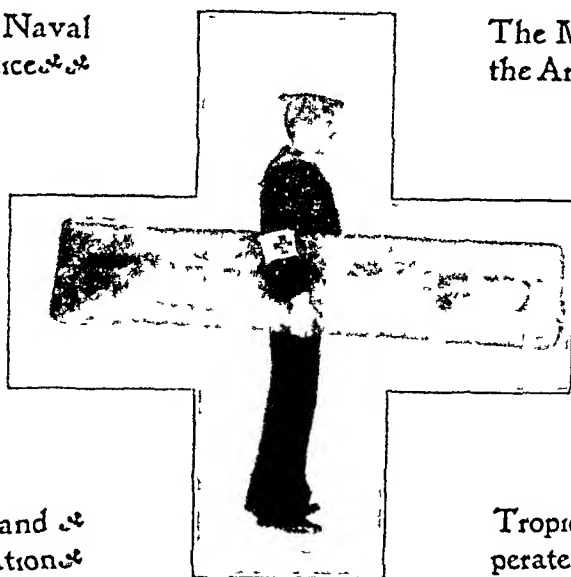
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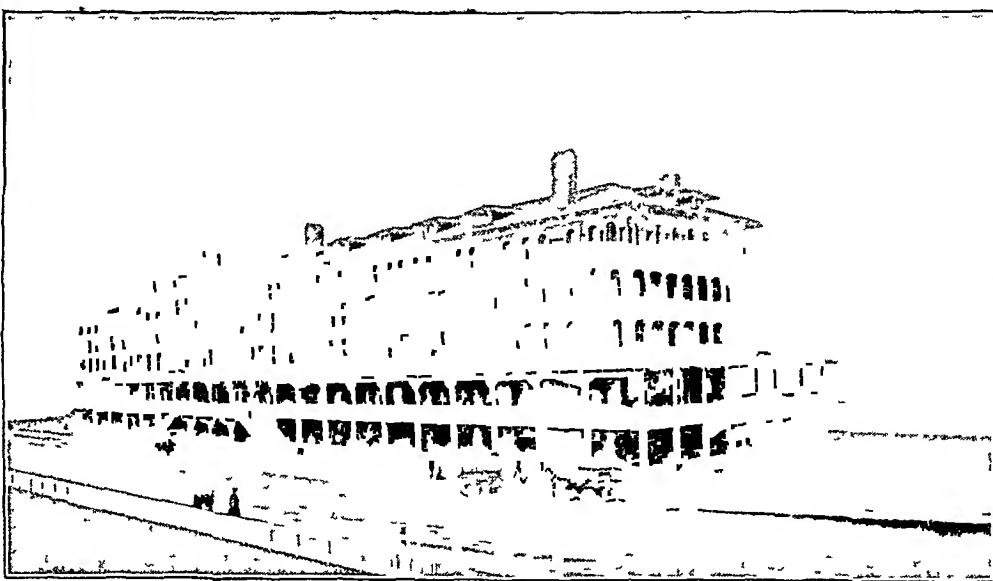
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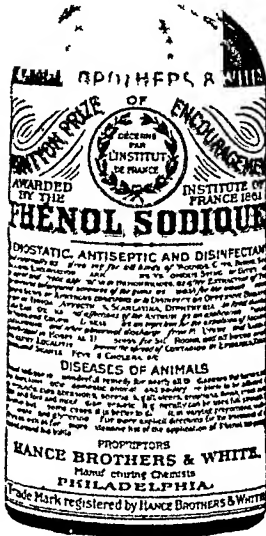
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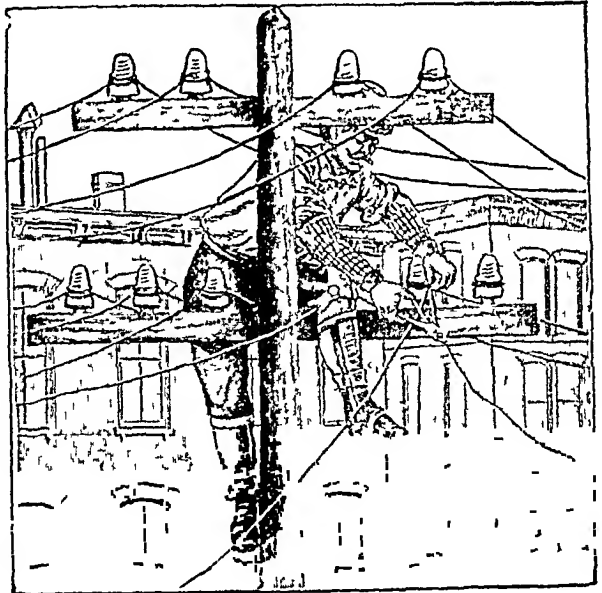
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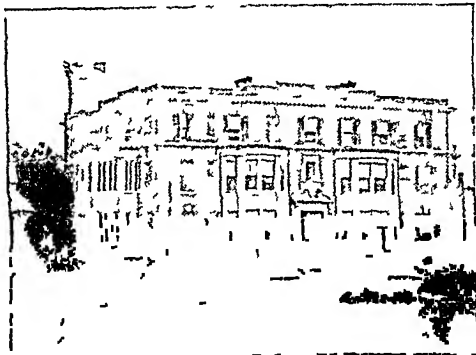
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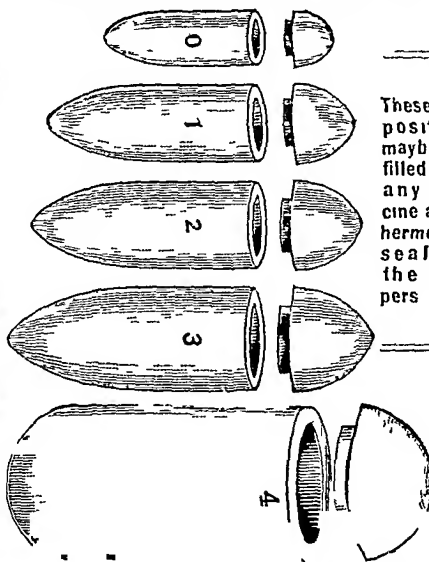
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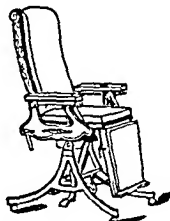
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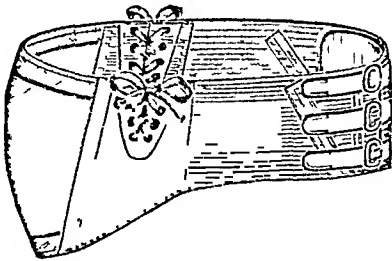
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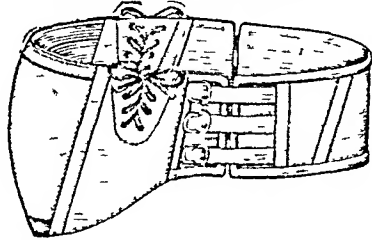
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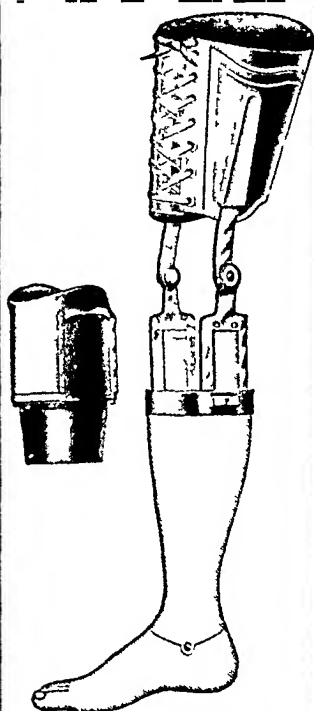
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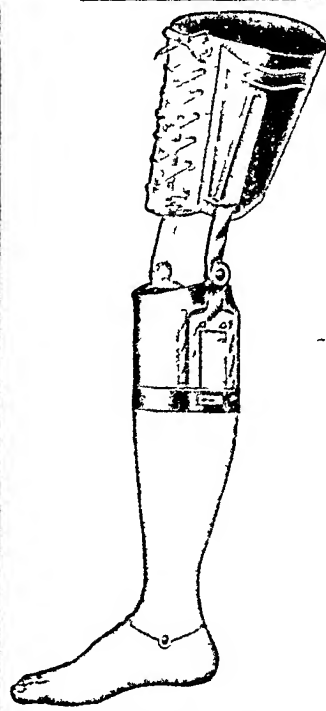
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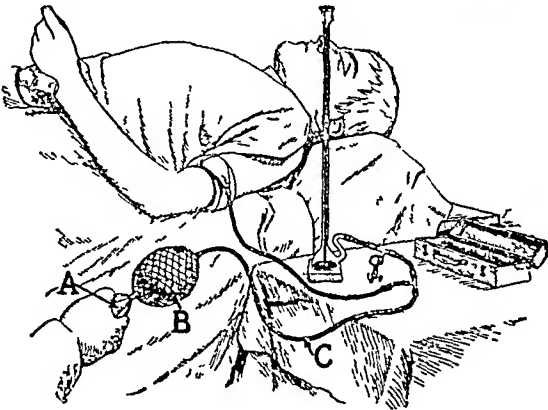
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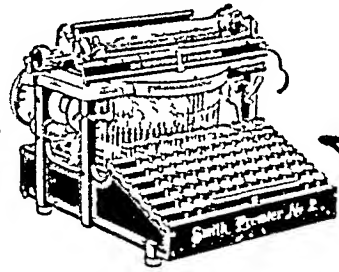
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# ANNALS OF SURGERY

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VOL XLIII

MARCH, 1906

No 3

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## ORIGINAL MEMOIRS.

---

### FRONTAL AND ETHMOID SINUS EMPYEMA.

REPORT OF A CASE CURED BY OPERATION

BY HENRY PERKINS MOSELEY, M D,  
OF NEW YORK,

Assistant Surgeon to the Manhattan Eye, Ear and Throat Hospital  
(Throat Department)

IN view of the large amount of work which has been done in the past few years on the accessory sinuses of the nose, I have thought that it might be of interest to report a case of Empyema of the frontal and ethmoid sinuses which offered unusual features before a cure was accomplished. These cases are not very common, although the diagnosis and treatment of them has been more satisfactory in recent years, and all additional light that we can get on them will be of considerable help. In this case operative procedures had to be repeated several times, but in spite of this the resulting deformity which is shown in the accompanying photographs, is not so great as might have been expected. Whether more radical measures should have been attempted at the very beginning is a question. I am inclined to think that if this had been done at the outset much of the subsequent trouble might have been avoided.

It is of course much easier, in looking back, to realize what should have been done, and the indications in these cases are sometimes misleading, for the patients often recover from an acute inflammatory process without needing an operation, but when they have gone on to abscess formation, and the intra-nasal drainage is insufficient, I think the treatment should be radical and thorough, removing as much of the diseased tissue as possible

The patient, C W F, 63 years of age, married, German, janitor, was referred to me by Dr F Tilden Brown. He was first seen on April 23, 1905, and from his physician and his son the following history was obtained

In January, 1905, he had an attack of influenza with marked supraorbital pain, which was followed by the formation of an abscess at the upper inner angle of the left orbit. This was opened at one of the smaller special hospitals in New York city on February 12 under cocaine anæsthesia, the patient remaining in the hospital three days, but as the discharge continued, he later had an extensive operation at one of the larger hospitals on March 16, on the left frontal sinus and left ethmoid. This operation is said to have been a "Killian". The wound was left open. He had erysipelas and was transferred to the isolation ward, returning to his home April 15. The wound gradually closed, and the patient did fairly well except that a purulent discharge continued from a silver tube which had been placed in the inner angle of the wound. On April 21, the tissues in the neighborhood began to swell and there was considerable pain associated with the swelling. On April 22, an incision was made over the outer part of the eyebrow, allowing the escape of considerable pus. He was at that time told of the necessity of a more extensive operation and was referred to Dr Brown through whose kindness I then saw him, on April 23, 1905.

Examination showed a man in good general condition except for a marked general arterio-sclerosis with irregular pulse and irregular heart action. His temperature was normal. The local examination revealed the left eye closed with a marked cellulitis and infiltration of the tissues all about it, running well up onto the forehead. At the outer end of the old "Killian" scar, which

extended outward perhaps two-thirds the length of the supra-orbital ridge there was a short incision  $\frac{3}{8}$  of an inch in length from which pus was oozing. Just below the inner canthus was a silver tube which ran straight backward and inward  $\frac{1}{2}$  inch, pus also discharged freely from this. When the eyelids were separated, the conjunctiva was suffused and boggy. Rhinoscopic examination revealed the presence of pus and crusts on the site of the left middle turbinate, which had evidently been removed. There was a small drop of pus at the site of the anterior and of the right middle turbinate, which was also missing. This was the only time that I detected any pus in the right nostril.

April 23, under nitrous oxide and ether anæsthesia, after inserting a post-nasal tampon, an incision was made from the outer discharging cut through the old scar down onto the nasal process of the superior maxillary. The tissues were all very œdematous. At the inner angle of the wound a probe detected loose bare bone and this was grasped with forceps and removed. Viewed in the light of subsequent events, this was probably the remains of the supraorbital arch and the floor of the sinus which had been left at the previous operation. It was irregular in shape, about  $1\frac{1}{4}$  inches long and  $\frac{1}{2}$  inch in its broadest diameter. When this was removed the cavity of the left frontal sinus was exposed, enabling the landmarks to be made out. This cavity was full of spongy purulent necrotic mucous membrane. This was all thoroughly removed with the curette, all dead bone was removed and the edges of the sinus were smoothed down with rongeur forceps. There was a fair-sized opening into the ethmoid and nasal cavity, this was thoroughly curetted and enlarged to the diameter of  $\frac{3}{8}$  of an inch. There was an absence of a considerable part of the septum between the two frontal sinuses, so that a probe passed into the right frontal sinus  $\frac{1}{2}$  inch beyond the midline. The right frontal sinus was then thoroughly curetted through this opening, much necrotic mucous membrane being found. The condition of the patient did not warrant further extensive operative procedures, and it was hoped that by what had already been done and by further intranasal treatment on the right side the wound would close and give no more trouble. After thoroughly flushing out both the wound, and the nasal cavity through the canal made into it, plain gauze

packing was placed (*a*) through the canal into the nose, (*b*) into the right sinus and in the wound which was left open entirely, and a dry dressing applied

*Subsequent History*—The patient did most satisfactorily following the operation. He had a good night, very slight pain, and required no stimulation. His pulse and temperature remained practically normal, the temperature once getting to 99° F

April 24—The drain through the nose was removed, all other drains were loosened, œdema was gone, conjunctiva was much better

April 28—The wound was granulating well, there was a very small amount of discharge, his condition was fine. The conjunctiva had cleared up. The patient could use the eye

May 9—The wound had healed over the eye, there was not much discharge. Since operation the nose had been irrigated from above through the inner angle of the wound. The left antrum was washed out through the inferior meatus but no pus was obtained

May 26—The wound had healed except at the inner angle close to the nose, where there was a small opening still persisting. It had not been possible to pass a probe into the right sinus from the nose nor had it been possible to pass any instrument down into the right nostril from the wound, although several attempts had been made with bent probes. Peroxide of hydrogen injected into the right frontal sinus through the wound did not appear in the right nasal cavity. At this time it seemed doubtful whether there was any communication between the cavity thought to be the right frontal sinus and the nose. It was thought that this cavity might have been an enlarged prolongation of the left frontal sinus. Transillumination of the right frontal sinus was not satisfactory and revealed nothing

Attempts were made by cauterization with saturated solution of nitrate of silver to close the fistulous opening, but a small amount of purulent discharge still coming from it, it was decided that operative procedures would be necessary to obliterate the cavity in order to cause the cessation of the discharge

*Operation*—August 2, 1905, Manhattan Eye, Ear and Throat Hospital. Nitrous oxide and ether anæsthesia, time



FIG 1

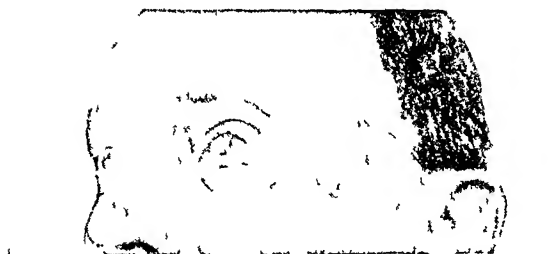


FIG 2



FIG 3





one hour. An incision was made from the fistulous opening directly across the bridge of the nose and curved out on the right supraorbital ridge to a point half-way between the inner and outer canthus. The skin and periosteum being elevated, the right frontal sinus was opened. It was found larger than was expected, extending outward to a point about halfway between the inner and outer canthus. There was considerable necrotic tissue in it. The anterior wall was removed entire and all projecting edges and irregularities were smoothed down. A probe was passed down apparently through the naso-frontal duct into the nose, but to my finger in the nostril it felt as though there was mucous membrane or perhaps slightly thicker tissue between it and the probe. The probe was pushed through this resisting tissue, and left in place while a post-nasal tampon was inserted. On the probe, as a guide, a small-sized bone curette was then passed down through the wound to the finger in the right nostril and the canal was curetted out. A strip of gauze was then carried through from above, brought out of the nostril and drawn back and forth, bringing away the debris of the curettage and enlarging the canal to nearly the diameter of the little finger. The necrotic tissue was then thoroughly curetted from the frontal sinus, from the canal leading to the old fistulous opening and all around this opening. All bony irregularities were removed and the cavities were made as smooth as possible. After thorough irrigation with boric acid solution, a plain gauze drain was passed into the right nostril from the right frontal sinus and one from the sinus out through the site of the old fistulous opening. The wound was then closed with interrupted silk sutures, except at the left angle where the fistula had been. Firm pressure was accomplished by dry compresses and a tight bandage.

The patient reacted from the operation well and left the hospital in a week. The wound healed satisfactorily except for slight stitch abscesses, which cleared up on the removal of the stitches and the application of a wet dressing for three days. The wound was irrigated a few days, the fluid coming out of the nose. The cavity was also irrigated from below through the canal which had been made through the ethmoid.

On August 19 there was absolutely no discharge from the old opening, which was getting very small, just admitting the

point of a probe and there was no discharge from the nose. The frontal sinus was apparently filling up satisfactorily.

On September 8 the wound had healed completely. There was no depression over the right frontal sinus, there was no discharge from the right nostril, there was a small drop of yellow pus at the site of the left middle turbinate which had been present from the beginning, and is due I think probably to a small amount of necrotic tissue in the ethmoid region. There was of course a marked depression over the left frontal sinus as the supraorbital ridge at its inner end had been removed. This is shown in the photographs.

Examination in December shows the condition the same except that a slight depression over the right frontal sinus exists.

I think the presence of some diseased tissue left in the right frontal sinus accounts for the failure of the wound to close after my first operation. There was no drainage from the right sinus into the nose, which may be accounted for either by excessive granulation tissue filling up the opening of the naso-frontal duct, or it may have been one of the cases in which the naso-frontal duct opens into an anterior ethmoid cell instead of into the middle meatus, or ends in a blind prolongation.

This latter view is rather supported by the fact that the probe which was passed through the naso-frontal duct in my second operation met with resisting tissue before it was passed through this into the nasal cavity. The rapidity with which the wound closed after the last operation forcibly illustrated nature's power of repair when irritating influences are removed.

If the patient's condition had been better I should have done a complete operation on both frontal sinuses at the first operation but his condition did not warrant more than was done at that time. I have reported the case and operations in full details as the conditions met were rather unusual. The very small amount of discharge from the left side which is still present is so slight as to be of no annoyance to the patient and the use of a cleansing spray daily makes him perfectly comfortable.





FIG 1—Drawn from death mask of cystic adenoma of thyroid gland Case 14729  
John Seely Hospital Medical Dept University of Texas

# ANATOMY OF A CASE OF CYSTIC ADENOMA OF THE THYROID GLAND.

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So seldom do we have the opportunity of making a complete dissection of a marked case of goitre that the writer feels no need to apologize for publishing the anatomic details of the following case and illustrating them by a complete series of figures

The drawings were made from the body of a seemingly full-blooded negress, aged 55, case 14,729, John Sealy Hospital, said to have died of asthenia

Fig 1, showing the external appearance of the tumor, indicates the fat, well-developed character of the body In the neck in the middle line and on either side of it, extending from the hyoid bone to the sternum, is a tumor which is so prominent on the right side as to rather obscure the evidence of swelling on the left The sternomastoids are somewhat separated by the growth and overlap it at the sides The tumor is globular and shows indications of lobulation Its right half is roughly 7 c m broad and 8 c m long in its greatest diameters, while the left half does not lend itself readily to measurement The right half of the tumor overlaps the middle line

On dissection the skin was found to be freely movable throughout, the platysma on each side somewhat hypertrophied and the platysma muscles interlaced with each other below the hyoid The anterior jugular veins were perfectly normal and did not seem to be enlarged On reflecting the platysma the superficial layer of the fascia lata presented no peculiarity It had the usual attachment to the hyoid bone, enclosed the sternomastoid on either side and split inferiorly as usual into two layers attached to the anterior and posterior lips of the upper border

of the sternum and between the layers was the usual vein uniting the two anterior jugulars

Fig 2 shows the deep fascia reflected to expose the first layer of infra hyoid muscles and sternomastoids. The right sternohyoid which covers the larger lobe of the tumor is very much hypertrophied, especially in its breadth, the muscle measuring 5.5 cm across at its broadest (about midway between the hyoid and sternum) and narrowing at either end. It is just about twice the size of the normal muscle. Both omohyoids are markedly hypertrophied, the left sternohyoid not so, but here I may be in error as the left side of the tumor was exposed in embalming the body and the coverings damaged. The tumor is seen to dip beneath the sternomastoid on either side. No large vessels are apparent. Between this layer of infrahyoid muscles is a distinct layer of fascia stretching between and splitting to enclose them. It is the normal layer of fascia which unites these muscles and can scarcely be said to be hypertrophied. Thus we have in it a second layer of deep fascia over the tumor.

In Fig 3 the sternohyoids, and omohyoids have been reflected, their fascia removed with them. The anterior edge of each sternomastoid has been deeply incised and the muscle partly drawn aside. The tumor is now found to be enveloped in a third distinct and in this case somewhat hypertrophied layer of fascia into which the sternothyroid muscles are inserted. These muscles are much hypertrophied, being each 5 cm broad at its sternal attachment. Each muscle extends as a muscular belly for about 4 cm upward from the sternum and is then lost in the fascia. There is no trace of an attachment of muscle or fascia to the thyroid cartilage, the fascia seems to have been stripped off the thyroid cartilage and retains its attachment only to the hyoid bone. No large vessels are yet to be seen except at each upper and outer angle of the tumor, where the superior thyroid vessels can be made out enveloped in fascia. The fascia laterally blends with the sheath of the sternomastoid. On the right lateral surface of the right lobe of the tumor a deep groove divides it into two masses. In the upper end of the groove a small portion of the upper end of the right sternothyroid muscle will be found (see Fig 5).

In Fig 4 the sternothyroid muscles and the fascia belonging to





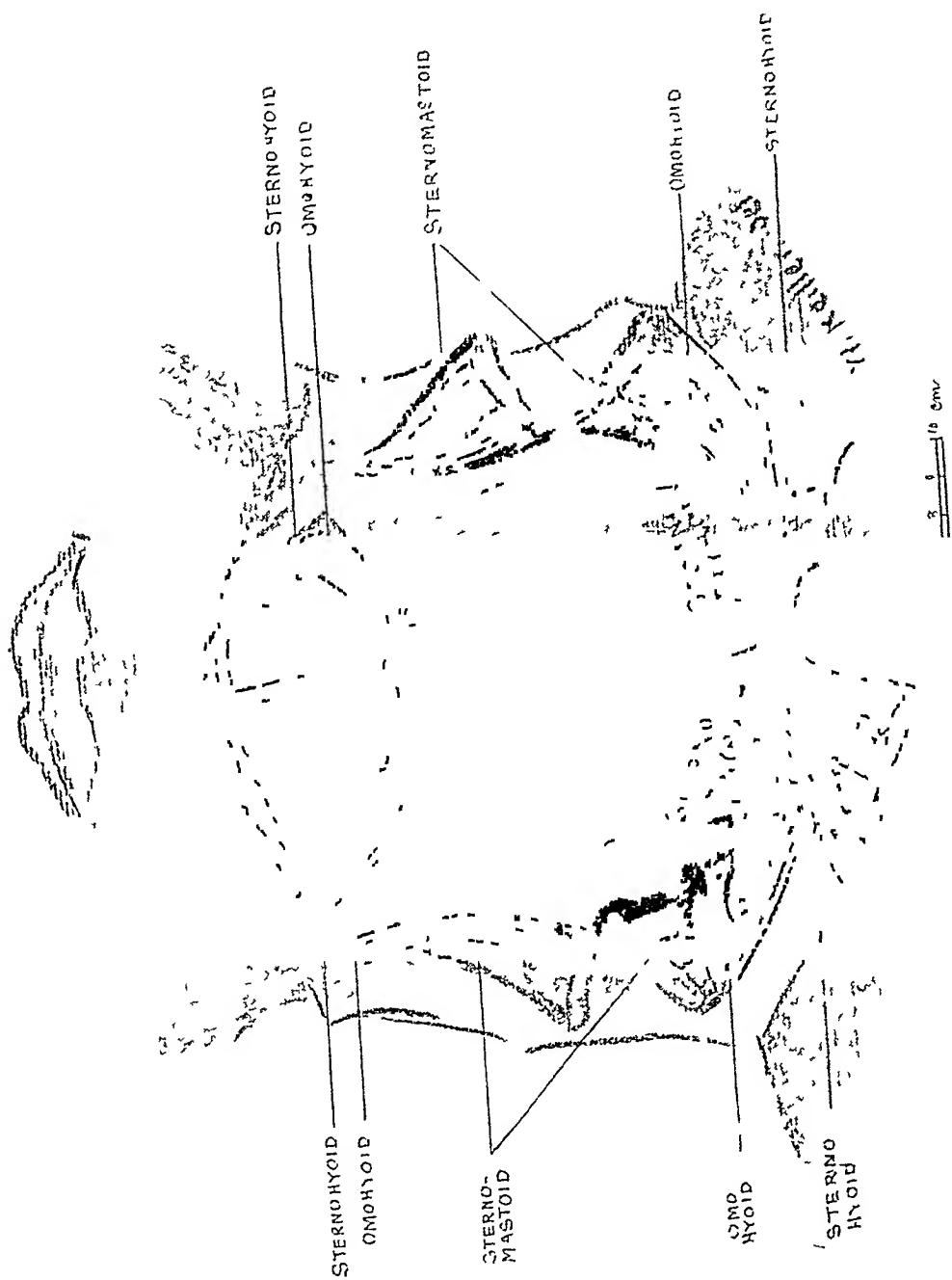


FIG 3—Second layer of muscles

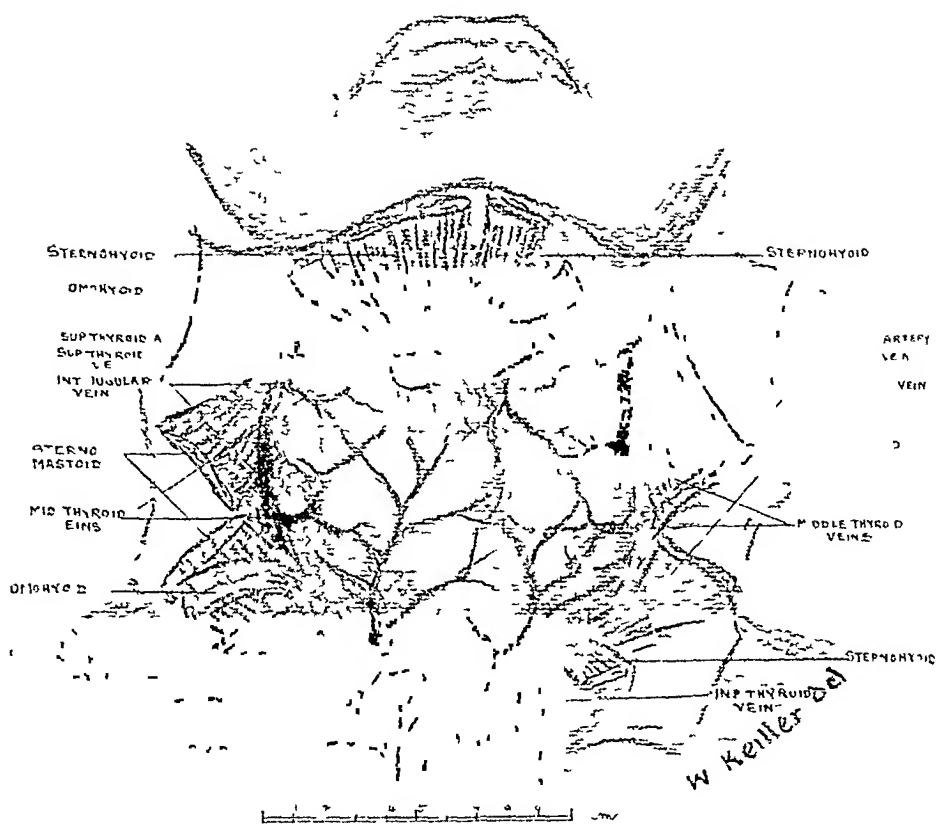


FIG 4 —Muscles reflected Capsule of tumor exposed



them which were found to form a complete anterior investment for the tumor have been reflected and the proper capsule of the goitre has been exposed. The sternum has been cut longitudinally and the superior mediastinum opened the better to investigate the lower relations of the tumor. For the first time important vessels are encountered and the tumor, freed from its compressing investments, seems larger than in any previous stage of the dissection. The tumor is now seen to consist of a right and a left half, each further sub-divided and all enveloped in the same capsule. The right half of the tumor presents a posterior portion, elongated and shaped like an enlarged lateral lobe of the thyroid. It appears to be free from cysts and looks like simple adenomatous tissue (simple hypertrophy). All the rest of the right half and the whole of the left half of the tumor are markedly cystic, the globular prominences of the individual cysts being very numerous. The whole surface of the tumor is covered by a dense network of large veins whose size cannot rightly be estimated in their empty condition. They are imbedded in and almost inseparable from the capsule and the figure only gives a faint idea of the larger vessels. The internal jugular veins are pushed outward by the tumor mass, and each vein is as it were anchored to the capsule by three large branches, a superior thyroid vein at the upper angle of the mass (about the usual level of the vessel) and two middle thyroid veins, the lower of which is about at what should be the level of the cricoid cartilage, while the upper seems an accessory vein and lies at what should nearly correspond with the upper border of the thyroid cartilage. Rather deeply under cover of the sternum and springing from the inferior angles of each lateral lobe of the growth are two large inferior thyroid veins. These veins all anastomose freely over the surface of the growth and send great branches in between its lobes. Excepting the main trunks they are thin walled and imbedded in the capsule. The trunks of these veins are enlarged, suggesting in size average median or ulnar veins as they appear at the elbow. Enveloped in the capsule of the tumor at each upper lateral angle is the only artery so far met with, namely, the superior thyroid. It is accompanied by the superior thyroid vein and is distinctly enlarged. Each superior thyroid artery sends a branch over the surface of the tumor but

passes mainly to its deep aspect. Its relations are practically normal and it is easily accessible to ligature. Coursing over each lateral surface of the tumor is the ansa hypoglossi, which has been dissected out of the fibrous capsule belonging to the muscular layer.

In Fig 5 the two halves of the tumor have been separated to show its deep relations. In incising the capsule along the line of division between the two halves of the tumor many veins required double ligation before being cut. This done, the two portions were separated so as to get at the deeper vessels. The superior thyroid arteries with companion veins were divided between ligatures on the side of the thyroid cartilage, the inferior thyroid arteries were ligated on the sides of the trachea. The relations and dimensions of the isthmus thyroidei unfortunately could not be made out with certainty, as it had been damaged in embalming the body. I think it was comparatively small (probably 1 to 1.5 cm in diameter) and firmly adherent to the first two rings of the trachea, a large branch of each inferior thyroid artery closely associated with it. The two segments of the goitre having been separated as in Fig 5, the trachea and larynx are exposed. The tumor being bilateral there is no appreciable bending of the trachea, though there may be some slight narrowing. None of the rings are softened. A little separate cyst has remained attached to the front of the trachea in association with the right inferior thyroid vein. It is an accident of dissection and is not especially adherent. By fully retracting each half of the goitre the carotid sheath is exposed on either side. The vessels have been markedly displaced outward by the tumor. From under each carotid sheath 2 to 3 cm above the level of the sternum the trunk of each inferior thyroid artery is seen to emerge. Each artery divides into an ascending and descending branch, the latter going one to each lower angle of the goitre and joining there the corresponding inferior thyroid vein, while each ascending branch enters its own lobe close to the isthmus. The ascending branch of each inferior thyroid artery on the side of the trachea is in close relation to the recurrent laryngeal nerve, a point of the utmost surgical importance. The dissection shows that the inferior thyroid arteries might be ligated without danger to the recurrent laryngeal nerves either where they enter the

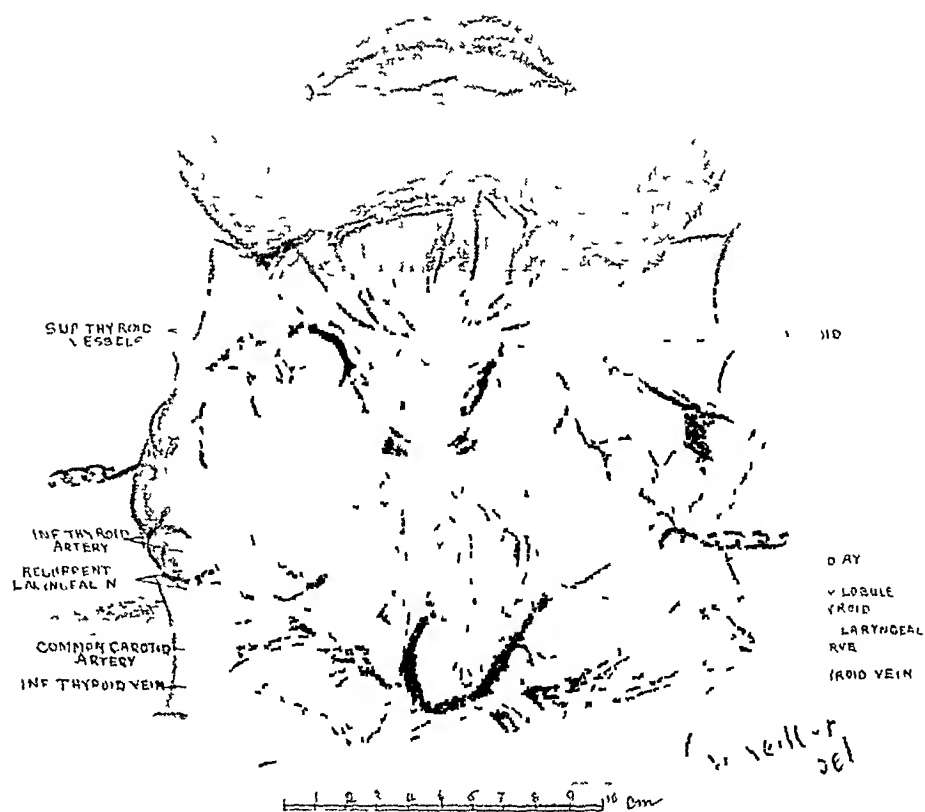


FIG 5 — Tumor divided, trachea and vessels exposed

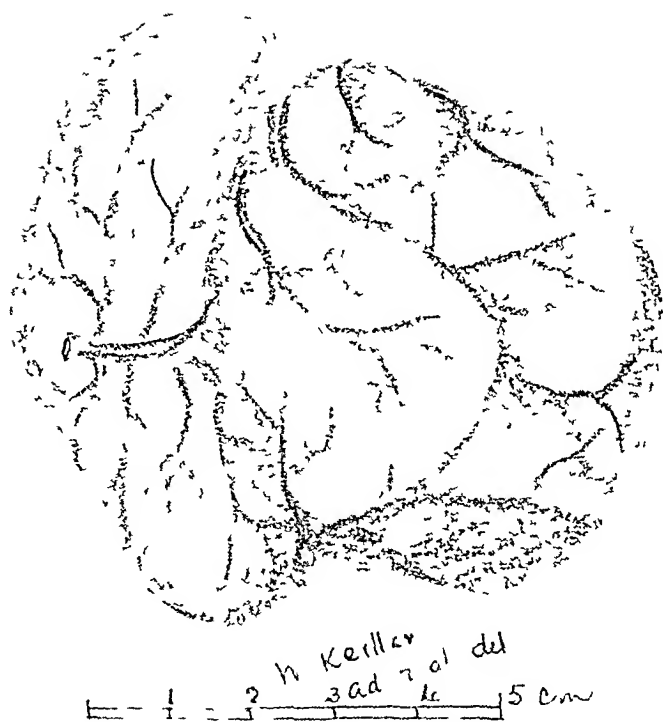


FIG 6—Outer surface of right lobe of hypertrophied thyroid

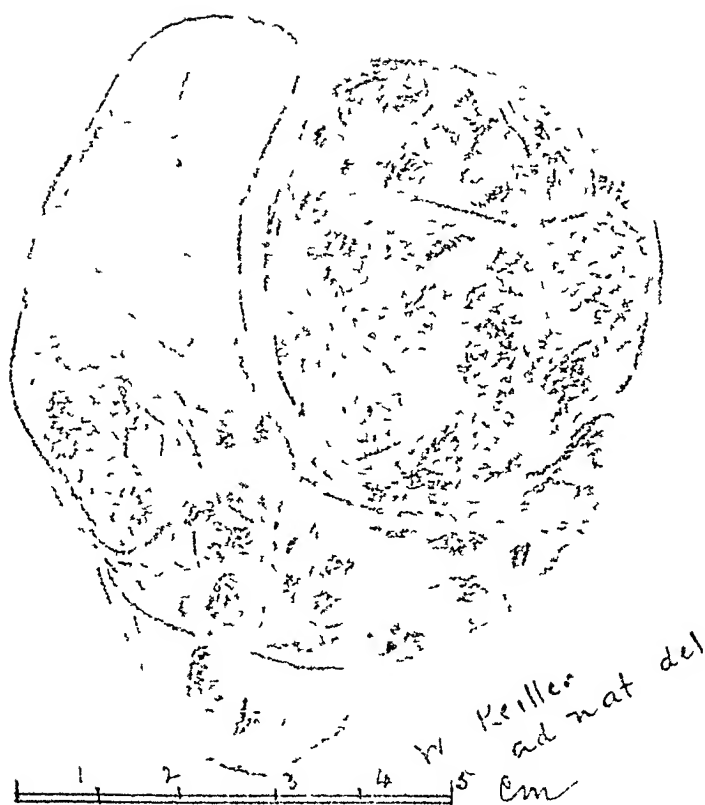


FIG 7—Section of right lobe of cystic thyroid gland





tumor at the antero-lateral borders of the trachea (and here there would be at least two large branches, an upper and a lower previously described, to be ligated for each inferior thyroid artery), or the trunk of each vessel might be safely ligated as it emerges from under the carotid sheath. The trunk of the sympathetic is not visible. Dissection shows that its close relationship to the carotid sheath in which it is imbedded has caused its displacement outward with the common carotid artery. The superior thyroid artery and companion veins are easily accessible to ligature, as they course over the upper angles of the tumor. I could find no thyroidea artery. Further dissection shows two large inferior thyroid veins, one opening into each innominate. Their trunks would be easily accessible, as the lower angle of each half of the growth is raised. The other veins are more accessible from the outer surface of the tumor as shown in Fig 4.

It will be seen that there is a distinct difference in character between the deep and superficial portions of the right half of the tumor, the superficial part being a congeries of cysts, the deeper seemingly simply adenomatous. The section however shows that the deep portion of the tumor is also markedly cystic in its lower segment. A small upper part of the right sternothyroid is seen attached to the thyroid cartilage and reflected upward. It was found occupying the angle between the deep and superficial parts of the tumor superiorly and attached to the capsule formed from the fascia of the sternothyroid muscles (compare Fig 4).

Fig 6 is a drawing of the outer surface of the right lobe of the thyroid. The arrangement of one of the middle thyroid veins is well seen, of the superior and inferior thyroid veins, and also the difference in superficial appearance between the smooth posterior portion and markedly lobulated anterior portion of the growth. Fig 7 shows that on section the difference is more apparent than real, the upper part of the posterior mass being the only portion free from cysts. The lower half of this portion of the tumor shows one large and many small cysts imbedded in a groundwork of simple adenomatous tissue, while the anterior part of the growth is one great mass of cysts with septa so thin as to be barely appreciable. All the vessels visible to the naked eye are in the capsule.

The left half of the tumor differs from the right half in presenting on its upper three-fourth an enormous number of smaller cysts, varying in size as seen by the naked eye from 2 m m to 3 c m in diameter. All these are evidently compound, each larger cyst being composed of many smaller ones whose capsules are thinning out toward obliteration, the capsule of the larger cyst being thickened. The lower fourth of this lobe has some normal gland in which are many small cysts. There were no post-esophageal or mediastinal extensions of the tumor. Microscopically the growth is a cystic adenoma of the thyroid gland.

The main points to be remembered in removing nonmalignant tumors of the thyroid body are

(a) The danger from hemorrhage which is mainly venous, and constitutes one of the chief risks

(b) The danger to the inferior laryngeal nerve

(c) The danger of compressing the trachea or its collapse if its rings be softened

(d) The danger of a peculiar postoperative toxemia probably from absorption of thyroid secretion, which is according to most operators greatly increased by much pressure on the tumor during its removal

(e) The danger of myxedema if the whole gland be removed

Bearing these points in mind the dissections in this case seem to me to teach the operator the following lessons

Easy access is essential to safe and speedy removal and with this in view, I would use a V incision, the upper limbs of the V beginning at the anterior border of each sternomastoid a little below the level of the angle of the jaw when the head is thrown back, and following the anterior border of each muscle and meeting about one inch above the sternum in the middle line. In this incision skin and platysma should be cut, large branches which frequently unite the anterior jugulars with the external jugulars looked for under the platysma and divided between ligatures near the upper angles of the wound, the anterior jugulars themselves farther down, and the vein joining them just above the sternum. The next incision should

be exactly along the same lines, should cut the omohyoids and sternohyoids as far from their hyoid attachments as will admit of picking up the lower ends and reuniting them at the end of the operation

The next sweep of the knife should take in the sternothyroids and the sheet of fascia which stretches between these and thence to the sternomastoid over the tumor (see Fig 3) No large vessels should be encountered so far (except the anterior jugular veins and their connections) It might be possible with care to avoid the ansa hypoglossi supplying the hyoid depressors and thus preserve these muscles The nerves should be found descending obliquely to the hyoid depressors over the carotid sheath in the upper two inches of the incision on either side With the view to saving these nerves and also to avoid injury to the veins of the immediately underlying special capsule of the goitre I would start with careful division of the muscular belly of the sternothyroid above the sternum and follow the fascia up cautiously on either side This last incision should enable the operator to throw up a flap consisting of all the hyoid depressors and the fascia connecting them which would fully expose the thyroid gland in its proper capsule So far bleeding should have been easily controlled The head should now be bent forward to relax any pressure on the veins which course over the goitre, and its general relations can be thoroughly examined to determine the extent and method of removal Remembering the importance of avoiding pressure on the trachea and in the light of the dissection before us (Fig 5) it would seem best to begin by dividing the veins and capsule between ligatures over the median dividing line between the right and left segments of the growth No vein should be cut without being first ligatured, lest it retract within the capsule and be troublesome to catch again Thus the two halves of the tumor could be separated, the trachea exposed, and the character and relation of the growth made out In this case one would readily see the comparatively healthy character of the deep portion of the right half of the tumor, and the superficial cystic portion could be removed by ligature of the superior thyroid vessels at the upper and inner angle, of the upper branch of the inferior

thyroid artery in front of the trachea near the isthmus, of the inferior branch of the inferior thyroid artery and the inferior thyroid vein at the lower angle of the tumor well forward and out of the way of the recurrent laryngeal nerve. Turning the gland now to the inner side cautious division of branches of the middle thyroid veins between ligatures would enable the operator to remove the superficial cystic portion of the growth. Nothing should be cut except between ligatures.

My uncertainty about the isthmus in this case does not enable me to argue from this dissection, but the experience of surgeons would suggest the division of the isthmus between ligatures as a step to be taken as soon as that part is fully exposed. The general cystic condition of the left lobe, taken together with the comparatively healthy character of the deep portion of the right lobe which we have resolved to preserve, should determine the complete removal of the left half of the goitre. The inferior thyroid vein is ready of access and should be first ligated and cut at the lower angle of the tumor. Rolling the tumor gently outward the inferior thyroid artery will be readily and safely accessible as it emerges from under the carotid sheath, thus avoiding risk to the recurrent laryngeal nerve which is close to the trachea. The superior thyroid vessels can now be taken at the upper angle of the growth, and lastly, turning the mass toward the middle line the middle thyroid veins will be ligated and divided as far as possible from the internal jugular. The cysts which our section reveals at the lower angle of the part we have resolved to leave need not trouble us, as experience teaches that they are likely to atrophy after operation. In closing the wound the depressors of the hyoid bone should be stitched together to preserve their function, and the danger attending the absorption of the thyroid secretion, the risk of venous oozing, and the difficulty of complete obliteration of the postoperative cavity suggest the necessity of gauze drainage at the lower angle of the wound. Elevation of the lower end of the bed and avoidance of a pillow might lessen the risk of mediastinal infection.

# THE RESULTS OF THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE <sup>1</sup>

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OF NEW YORK,

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IN a paper read before the American Surgical Association in 1903 (ANNALS OF SURGERY, 1903, xxxviii, p 161) the writer reported the results of eighteen cases of exophthalmic goitre operated upon by him, and his present desire is to give later reports on some of these cases and to add three recent cases. It is perhaps worth mentioning that there has been an apparent increase in the opposition to surgical treatment although the results of non-operative measures have not improved very much in spite of the use of various serums and of the Rontgen ray. Both the latter methods, as well as Abbé's method of burying a tube containing radium in the gland, are on trial as yet, for it is too early to know how complete and how permanent the results may be. The arguments of some of the medical authorities seem hardly fair. Eulenburg (*Deutsche Klinik*, 1904, vi 744), for instance, making the extraordinary statement that patients do not die of exophthalmic goitre, a statement which hardly needs contradiction. We readily acknowledge that the majority of cases yield to medical and hygienic measures if the circumstances of the patient admit of proper treatment being fully carried out. But these conditions often cannot be fulfilled and many cases also are severe and resist treatment obstinately even from the beginning.

In the writer's opinion surgery should be reserved for severe cases which have resisted medical treatment, but this does not mean that it should be undertaken as Eulenburg wishes as a last resort and forlorn hope, for there can be no doubt

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<sup>1</sup> Read before the Pennsylvania State Medical Association, September 27, 1905

that the mortality is greater in the bad cases than when the symptoms are slighter and the patient is in better condition. On the other hand we cannot advocate immediate and early operation in every case, because many recover with medical measures alone, and because there is a mortality to operations even in the comparatively light cases, although the risk is less than in the serious ones.

The only operations which need be considered are partial thyroidectomy, and extirpation of the cervical sympathetic nerve and ganglia. Ligature of the thyroid vessels has a palliative effect and is especially useful as a preliminary to thyroidectomy.

Sympathectomy was first advocated by Jonnesco (Balacescu, *Arch f klin Chin* 1902, lvi p 59). Hoping to avoid the acute thyroid poisoning which had made the mortality of his thyroidectomies so high, the writer tried sympathectomy in seven cases, but met with the same ill-fortune, two deaths occurring from acute thyroidism and one from the anæsthetic. Full details of these cases are given in the paper already alluded to. Of the four patients who recovered, the following report is made up to the present time. The numbers are those of the previous paper.

CASE XII—M F, female, 25 years old. Operation, May 17, 1899, middle and inferior ganglia of the cervical sympathetic removed on both sides. May 5, 1904, five years after operation, she was examined just after recovery from an attack of grippe. Pulse 70 to 90 while in bed, and even when the temperature had been 104, the pulse only reached 100 to 108. Thyroid gland normal in size and consistency. The eyes were normal, pupils dilated. The heart was normal, without murmurs. She had no tremor, was not nervous, slept well and had been able to work.

CASE XIV—M B, female, 28 years old. Operation, December 2, 1902, all sympathetic ganglia removed from both sides of neck. Primary union followed by immediate improvement of all symptoms. October 11, 1903—Thyroid gland enlarged again, median lobe as large as a hen's egg. Pulse 138. Coarse tremor of fingers. January, 1904—Improved since last note until the present, but is suffering from an attack of grippe and is much

worse March, 1904—Very ill When put to bed, pulse dropped to 60 and so remained, but with poor force Ran a high fever, without leucocytosis, and died March 20 Autopsy revealed an acute endocarditis without other lesions of importance

CASE XV—E F, female, 23 years old Has had exophthalmic goitre for two years, and had thyroidectomy of right half performed about one year before, with temporary improvement, then relapsed Extreme exophthalmos, pulse 110 to 150, very nervous, tremor, dyspnoea Operation, December 2, 1902, all cervical ganglia of the left sympathetic removed, December 19—Same operation on right side Immediate improvement September 11, 1905—Is doing full work as chambermaid Rides a bicycle Sleeps and eats well Neck smaller, measuring 11½ inches Pulse 120 while standing after walking Eyes improved, left being no more noticeable than an ordinary myopic eye, right rather more prominent No tremor or twitching, manner quiet, face does not flush

CASE XVII—L W, female, 26 years old Operation, January 17, 1903, all cervical sympathetic ganglia of both sides removed May 11, 1903—Neck measures 15¾ inches Exophthalmos is less, can shut right eye completely, left eye almost, convergence normal, eyelids follow eyes downwards Pulse 100 Feels well February 13, 1904—Her physician reported that patient has developed nephritis and a cardiac lesion, and has had œdema of the limbs for three to five weeks The goitre has shrunk during this illness Early death was expected

Of these four cases, then, one relapsed within nine months, and a little over a year after the operation, she died of the original disease with an acute endocarditis One case was completely cured five years after operation One case was almost cured and still improving when she acquired nephritis about one year after the operation, and has probably since died The remaining patient is able to do her work and enjoy life without medication, although goitre, exophthalmos, and slight tachycardia persist—a practical cure We may safely conclude that the ultimate results of sympathectomy are fairly satisfactory But the operation is much more difficult than thyroidectomy, not so easily done with local anæsthesia,



and the mortality is fully as high. Moreover, the scars come so high up that they are more disfiguring, by no means an unimportant factor, as the patient's employment often depends upon her appearance. For these reasons the writer has again turned his attention to thyroidectomy.

Three new cases have to be reported here.

CASE XIX—Fanny C, single, United States, 28 years old, teacher. Was first seen by me in May, 1903, and her condition was so serious that I insisted on several months of rest and medical treatment before operating. October 19, 1903, she was admitted to St. Luke's Hospital in much better condition. Menstruation had been irregular and scanty. Nine years previously she had first noticed a swelling in the median line of the neck, which had gradually increased and for the last three years had interfered somewhat with swallowing. No nervous symptoms or dyspnoea at present. Slight exophthalmos. Eyelid follows eye in looking down. Thyroid gland considerably enlarged, with expansile pulsation, and with a murmur to be heard all over it. The largest circumference of the neck is  $14\frac{1}{2}$  inches. The strong pulsation of the heart is visible all over the præcordium. There is no hypertrophy. A loud systolic murmur is heard, especially at the apex. Lungs, examination negative. There is a fine tremor of the fingers. Pulse 84 to 120. Operation, October 20, 1903. Cocaine local anæsthesia. Ligation of right inferior thyroid artery. Cervical sympathetic nerve divided near second ganglion. Wound sutured and drained. Pulse 100. October 21—Pulse 124, and temperature  $104^{\circ}$  at the highest. The right pupil is contracted, there is slight ptosis of the right lid, and that side of the face is flushed. The pulse reached 100, and the temperature was normal, on the fourth day. Primary union was obtained, the drain sinus being closed by the 26th. October 28—Operation. Right superior thyroid artery ligated under local anæsthesia. There was but little febrile reaction and primary union was obtained. November 6, the goitre was smaller, the pulse lower, and the nervousness gone. December 6, 1903—Pulse 84 to 120. Greatest circumference of neck  $13\frac{5}{8}$  inches. December 7—Operation. Left inferior thyroid artery ligated under local anæsthesia. The pulse was 132 and the temperature  $102^{\circ}$  at the highest and became normal in

three days December 14—Operation Left superior thyroid artery ligated under local anæsthesia After slight reaction the pulse and temperature became normal in three days Primary union was obtained in both wounds, although a hematoma formed in the second She continued to improve, but I advised thyroidectomy to guard against a relapse

March 21, 1904, she was readmitted to St Luke's Hospital The pulse was 80 to 100, rising to 120 on exertion April 1, 1904—Operation The right half of the thyroid gland was removed, by an oblique incision following the other scars The skin was incised with local anæsthesia, and the operation begun But there was very troublesome venous oozing, requiring the actual cautery to check it, and the parts were so sensitive as to make deep dissection very painful, and chloroform was administered This was well borne, the pulse being only 116 at the end The wound was sutured and drained Eight hours later the temperature rose to 102° and the pulse to 140 The following day the pulse was 150 and the temperature 101<sup>3</sup>/<sub>8</sub> at the highest The urine, always previously normal, contained one per cent of albumin There was restlessness and nausea Primary union was obtained April 28—The pulse is 100 while standing after walking Greatest circumference of neck is 12 inches No tremor Sleeps and eats well September 20, 1905 (about eighteen months later), she reports that she is feeling perfectly well and is going on with her work Pulse 70 Menstruation regular during last year Has married and lost her husband in the past year

CASE XX—Annie C, 28 years old, single, born in United States When first seen was in poor condition and was treated by her physician for three weeks with rest, icebag to the heart, aconite diet, etc, with considerable improvement April 19, 1905, admitted to the General Memorial Hospital She had always been nervous Menstruation regular, formerly profuse, latterly less so For last year has been very nervous and has had severe frontal headache Neck has increased in size She has had pronounced tremor and twitching of the extremities and palpitation of the heart Pulse now 105 to 112 (When first seen was 130) No albumin in urine The exophthalmos is slight, the enlargement of the thyroid moderate The patient is extremely nervous, and the tremor very well marked

Operation, April 20, 1905—Cocaine anæsthesia was tried, but patient was hyperæsthetic and absolutely uncontrollable, trembling and twitching, yet eager to have the operation carried out. Chloroform had to be administered after the skin had been incised, and the operation was rapidly completed, the right half of the thyroid gland being removed. The wound was sutured and drained. The patient was somewhat cyanotic and the pulse was 145, respiration 44, and temperature  $101^{\circ}$  when she was put to bed. About eight hours after the temperature had reached  $102\frac{2}{5}^{\circ}$ . At noon next day the pulse was said to have been 230, respiration 58, and patient was thought to be dying, but rallied and was able to talk and acted rationally all the afternoon. The temperature, however, rose to  $104^{\circ}$ , the pulse running 144 to 165, the respiration became more labored, and she died about forty hours after the operation. Albumin and hyaline casts were found in the urine after operation.

CASE XXI—Maud W, 24 years old, single, born in United States. Admitted to General Memorial Hospital April 11, 1905. Menstruation regular. Had nervous prostration for three months, two years ago. Four years ago throat began to enlarge and has steadily increased in size. Now the greatest circumference is  $14\frac{1}{2}$  inches. Four months later became nervous and exophthalmos began, increasing ever since. In last two years has grown less nervous. Since her neck swelled, has had moderate dyspnoea on exertion, and mild palpitation of the heart. Sleeps well. Has several times had attacks of great nervousness and restlessness with high fever. Pulse 110 to 130. Heart apex beat normal, with marked pulsation of præcordium. Reduplication of valve sounds and confused indefinite murmurs. Systolic murmurs in both carotids. No thrill. There is extreme exophthalmos, so that the lids do not close by a space of one quarter of an inch, and do not follow the eyes in looking down. There is moderate nervousness, patient having good self-control. Slight tremor of fingers. Moderate enlargement of the thyroid gland. Two weeks were spent in preliminary treatment in bed with icebag to heart, bromides, aconite, and limited diet (no red meat). Operation, April 25, 1905. Under cocaine anæsthesia, the right superior thyroid artery was ligated. Wound sutured without drainage. The temperature rose to  $102\frac{3}{5}$ , pulse 134, next day, and was three

days in falling to normal, but primary union followed, with immediate though slight improvement in the patient's subjective symptoms, especially the loss of strained feeling in the eyes May 1 she could close the eyelids completely Pulse 90 to 100 May 5, 1905, operation Under cocaine anæsthesia the right half of the thyroid gland was removed The parts were very sensitive, requiring much cocaine, but the patient was very courageous and patient The wound was sutured and drained There was a marked febrile reaction, temperature  $102^{\circ}$  and pulse 134, with gradual fall to normal Primary union was obtained except in the drain-sinus, which discharged a sticky serum abundantly and was still open when patient was discharged two weeks later All symptoms were immediately improved September 8, 1905, she writes that she considers herself well Pulse 72-84 No dyspnoea Eyes less prominent Sleeps well Still has slight tremor of fingers

The previous paper contained a study of the condition of acute thyroidism, which has been the cause of death in almost all my fatal cases Acute thyroidism is marked by a rise of temperature with exacerbation of all the ordinary symptoms of the disease In all six fatal cases there was albuminuria also, but in only two of these was it present before operation If found, albuminuria would furnish a strong reason for declining operation One case of thyroidism which recovered had albuminuria The cause of this condition is not yet definitely known The most popular theory ascribes it to absorption of the thyroid material from the wound, but this explanation is altogether too crude to be acceptable In the first place, attacks of acute thyroidism are seen in the usual course of the disease when the patient is leading an ordinary life, or under general treatment only, without any local measures

Secondly, any nervous excitement, a fright, anxiety, even ordinary business worry will often bring on an attack If there is a history of such attacks as in Case XXI, especial precautions are necessary in undertaking surgical treatment In one of my cases the symptoms set in a couple of hours before the time appointed for operation and the latter was

postponed It cannot be claimed that in this case the crisis was due to rough handling of the gland during the usual antiseptic preparation of the neck, for the latter had taken place over twelve hours before Fatal thyroidism followed the operation in this case

Thirdly, the symptoms are seen just as frequently after sympathectomy as after thyroidectomy, and also after operations done on distant parts of the body in patients with exophthalmic goitre, for instance, ovariectomy (two cases), appendectomy, amputation of the breast, tonsillotomy, uterine curettage, tooth extraction (See Sanderson, *Amer Medicine*, 1905, ix p 197, and Mayo, *Medical Record*, November 5, 1904

The so-called aseptic fever following operations without infection, or with so little infection that primary healing of the wound is not prevented, a fever which in the ordinary individual produces very slight disturbance, might very well be much more serious in persons with exophthalmic goitre, and this suggests a partial explanation In a study of aseptic fever some years since (*Medical News*, June 24, 1899) the writer suggested the possibility of operative shock causing a rise of temperature like aseptic fever under some circumstances, and he believes that there is an element of shock in acute thyroidism The causes of acute thyroidism are probably complex and include the nervous strain of undergoing an operation, the disturbing effects of general anæsthesia on various functions of the body, the shock of the operation itself, and the absorption from the wound of toxic materials—quite as much as the chemical bodies produced by minimal septic infection as the products of the thyroid gland

In the former paper the conclusion was reached that general anæsthesia was to be avoided, and shock reduced by every means possible in order to escape acute thyroidism In the three recent cases this was attempted by employing cocaine anæsthesia, and by dividing the operation into several sittings In two cases this produced excellent results, in the third general anæsthesia had to be employed, and although chloroform was used, acute thyroidism promptly followed, and death ensued If chloroform had been administered to the last patient, and

a thyroidectomy done without preliminary ligation, it seems certain that death would have resulted, for even the comparatively slight operation of ligation of the superior thyroid artery under cocaine anæsthesia was followed by severe febrile reaction

Experience thus favors the earlier conclusions. In addition to the advice to divide the operation by performing preliminary ligation of the arteries, and to use local anæsthesia, I would now add that it is advantageous if not absolutely necessary to have the preliminary treatment by rest in bed, icebag to heart, bromides, etc., carried out at the hospital where the operation is to be done, in order that the patient may learn to know and trust the surgeon, and to like the nurses, growing familiar with her surroundings. This adds greatly to the efficiency of the control of the patient under local anæsthesia.

Reviewing the results of thyroidectomy, we have in all fourteen cases with four deaths, all from acute thyroidism. In addition to the two recovered cases just reported, final reports on the cases in the former paper are as follows

CASE I—L. E., 24 years, female. Operation November 11, 1893, right half of thyroid removed. September 1905, twelve years after, continues well. Pulse 80, eyes still somewhat prominent, no tremor or palpitation. Is running a millinery business.

CASE III—S. B. H., female, 43 years. Operation October 2, 1894, right half of thyroid removed. September 1899, five years after, has been doing hard work and feels well. Nervousness almost gone. Pulse 100. Eyes still prominent but much improved.

CASE IV—A. B., female, 21 years. Operation November 29, 1895, left half of thyroid removed. Six months later patient was perfectly well, the pulse being 74, no nervousness or insomnia (Booth).

CASE V—N. C., female, 17 years. Operation December 17, 1895, right lobe of thyroid removed. 1902, seven years later, no nervousness, palpitation or exophthalmos, pulse 90.

CASE VI—A. T., female, 35 years. Operation January 11, 1896, left half of thyroid removed. 1898, two years after operation all nervous symptoms had disappeared, pulse was 84.

CASE VII—R W, female, 27 years Operation October 13, 1897, right lobe and upper half of left lobe of thyroid removed Immediate improvement, pulse 98, but patient has not been seen since

CASE IX—M C C, female, 18 years Operation January 28, 1897, right half of thyroid removed Improved, but relapsed January 12, 1899—Left superior thyroid artery ligated Improved In 1902 the improvement continued, but lately she has relapsed and now has severe symptoms (1905)

CASE X—M E McK, female, 36 years Operation November 13, 1897, left half of thyroid removed April, 1902, was practically cured, less nervous, no tremor, eyes hardly noticeable, pulse 80 to 90, and was working hard as a bookkeeper September, 1905, she continues well

Of the ten patients who recovered from operation, one was improved but has not been seen since One case was improved for two years, relapsed, later had one artery tied on the other side with improvement and again relapsed Eight cases can be claimed as practically cured, having been followed six months (two cases), eighteen months, two years, five years, seven years, eight years, and twelve years Two of the cases were slight, but the rest were serious and some in a dangerous condition The four patients who died were all advanced cases These results are encouraging, and partial thyroidectomy has apparently yielded better results than sympathectomy But in one of my cases the latter has effected a practical cure after a relapse following thyroidectomy On the other hand a relapse with fresh enlargement of the thyroid occurred in one case after sympathectomy, and perhaps a thyroidectomy would have brought about a cure here if we had been able to get the patient's consent A temporary improvement was obtained in one of the relapsed cases by ligation of one artery on the other side, the improvement lasting two years or more

This question of the proper treatment of relapsed cases is very interesting Schulz (*Beitraege zur klinische Chirurgie* xxx p 638, 1901) had three cases relapse out of twenty treated by partial thyroidectomy, and operated a second time upon

the remaining portion of the gland, obtaining two cures. The other patient relapsed again and he was persuading her to submit to a third operation, as in his first operation he had merely shelled out a nodule, without actually resecting the gland. He states that in every case of relapse the remaining portions of the gland have undergone further enlargement. This continued growth of the gland also occurred in my two relapsed cases, and it seems to indicate that another partial thyroidectomy would be the proper treatment, provided that enough thyroid could be left to prevent cachexia strumipriva. If the patient upon whom I did a sympathectomy for a relapse following thyroidectomy remains as well as she is now (nearly three years after operation) we might suggest sympathectomy as an alternative when thyroidectomy was not considered wise.

The effect of the operation upon the various symptoms is interesting.

*Eyes*—The exophthalmos is generally immediately lessened, but seldom entirely disappears. There may be a hypertrophy of the connective tissue of the orbit in long standing cases which is never entirely reabsorbed. But even when the exophthalmos continues the patients are at once relieved of the strained feeling of which they generally complain and the expression is less staring. The eyelids can be completely closed and they follow the eyeball properly in looking down.

*Thyroid Gland*—In successful cases the remaining part of the gland is stationary or even diminishes in size. A relapse is accompanied and sometimes preceded by an enlargement of this remainder.

*Circulation*—The pulse generally responds early, being reduced in frequency, and gaining in regularity and force as soon as the post-operative reaction has passed. In Case VI the pulse fell from 120 to 90 during the operation, becoming more rapid again, while the febrile reaction lasted, then falling permanently below 90. But in many cases the tachycardia persists, the pulse running 90 to 100 at rest and even reaching 120 on exertion, yet the patients feel so much relieved of the former tumultuous and irregular heart action that they consider themselves perfectly well and go about their regular lives without medication.



*Nervous System*—There is an immediate improvement in the tremor, nervousness, excitability and insomnia, with a complete loss of the feeling of anxiety so common in this disease. The patient often notices this effect and speaks of it even on the day after operation, although it is not marked generally until after the postoperative reaction has subsided.

An indiscriminate collection of cases from literature would not give an accurate picture of the results obtainable by operation. But we can combine the figures of Schulz,<sup>1</sup> Kocher,<sup>2</sup> Mayo,<sup>3</sup> and Hartley<sup>4</sup> with my cases, making a total of 136 cases treated by thyroidectomy, with 17 deaths, chiefly from acute thyroidism. Four relapses are noted in this list, and several cases were lost sight of early. (Mayo gives no data to allow of proper classification of his cases) but there appear to be over one hundred cases cured, or practically cured. It has been said that the operative successes represent the periods of temporary improvement so often seen in exophthalmic goitre with or without treatment. But so many of the patients in these lists have been followed for several years and have continued well without any treatment whatever, doing their ordinary work, and sometimes very hard work, that this theoretical explanation of the results is absolutely untenable. Whatever the danger of operation may ultimately be shown to be, even if it should continue with a mortality of twelve per cent or more, there can be no doubt that nearly all of the survivors will be cured of their symptoms, and it will probably be long before any internal treatment will be able to show such results in advanced cases of this most distressing disease.

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<sup>1</sup> Loc cit   <sup>2</sup> *Mitth a d Grenzgebiete*, 1902, ix   <sup>3</sup> Loc cit   <sup>4</sup> ANNALS OF SURGERY, July, 1905, p 33

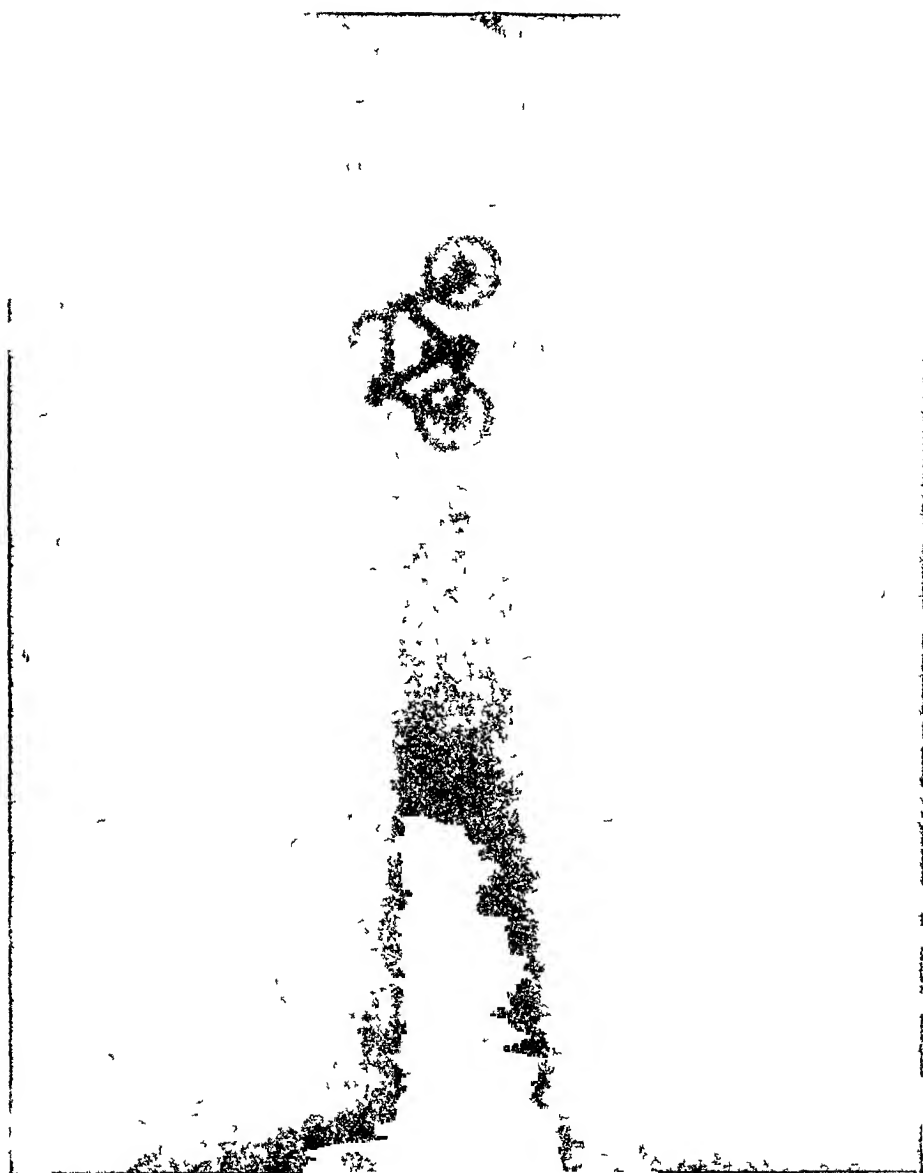


FIG 1

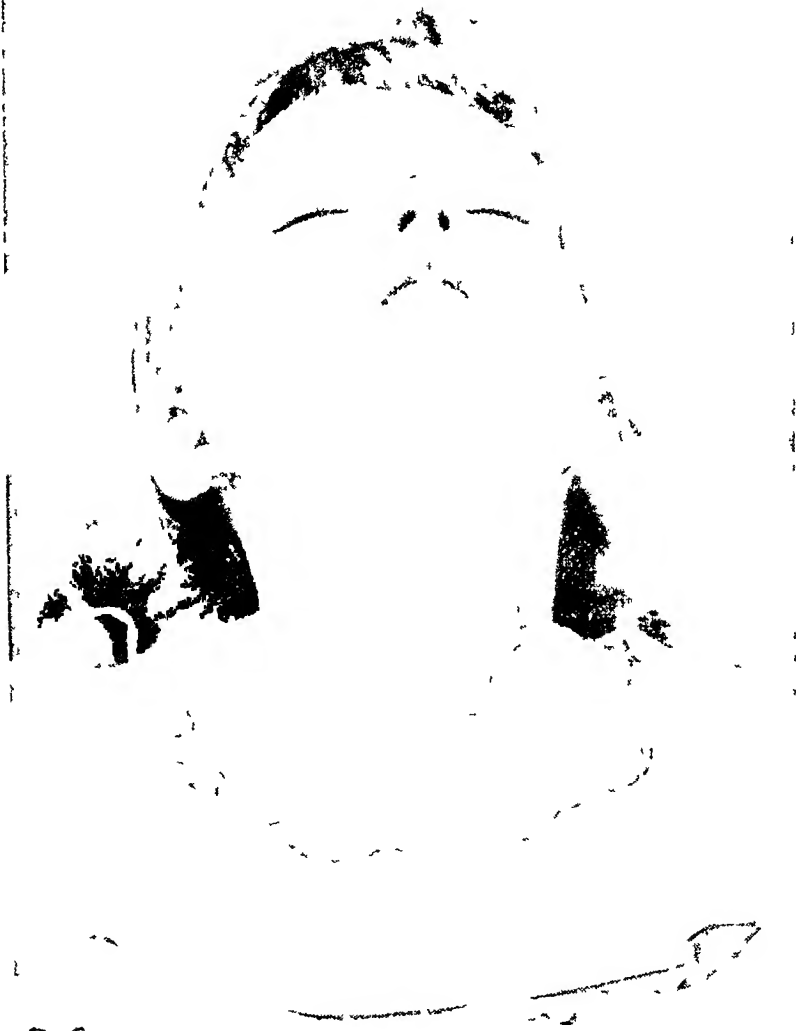


FIG 2

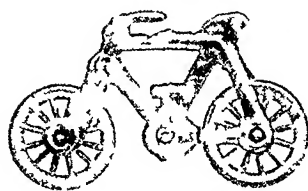


FIG 3

# IMPACTION OF A TOY BICYCLE IN THE ŒSOPHAGUS, SUCCESSFUL REMOVAL BY ŒSOPHAGOTOMY

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Most operating surgeons are called upon at one time or another to remove some quaint foreign body introduced into one of the various orifices of the human anatomy. Every test-book on Surgery contains records of such articles which had been safely extracted from the rectum, vagina, urethra, etc. The "Bust of Napoleon" unearthed from the rectum and the "Pomatum Pot" from the vagina are classical. The foreign body introduced in this case was a leaden model of the ordinary form of up-to-date safety bicycle.

In August, 1905, a little girl aged 4 was brought up to the London Hospital by her mother with the following history —On the previous day the child had swallowed a small toy metal bicycle, which she was holding in her mouth. Since then she had had frequent attacks of severe retching and had been unable to take any food.

Shortly after her admission a radiograph of the thorax was taken and the bicycle was clearly shown.

It was evidently impacted in the œsophagus at the upper part of its thoracic course (*Vide* radiograph 1.)

A bougie was passed down and an obstruction was met with some seven inches from the teeth.

An external examination of the neck was negative. An anæsthetic was administered and prolonged attempts at extraction were made by instruments passed through the mouth. Various forceps and coin-catchers were tried, without success.

On the next day the child was again anæsthetized and the thorax examined by an X-ray screen. The bicycle was seen to

be in its original position The operation of œsophagotomy was then performed in the usual way

When the œsophagus was opened it was found that the rim of the upper wheel could be easily seen just below the lower extremity of the wound in the œsophageal wall The bicycle was extracted with some difficulty, as the handles were fixed in the wall of the œsophagus and these had to be cut off before removal could be accomplished

The wound in the œsophagus was then closed by two rows of fine catgut sutures The skin wound was partially closed and free drainage provided

For three days after the operation there was some swelling of the neck and daily rise of temperature

Discharge of saliva and some food contents came away through the wound during the first week, although feeding was carried out entirely through an œsophageal tube This discharge ceased after a week and the drainage tube was dispensed with on the tenth day

The further progress of the case was uneventful The child left the hospital able to take ordinary food without any difficulty

The accompanying photograph (2) was taken three weeks after the operation

# OVERLAPPING THE APONEUROSSES IN THE CLOSURE OF WOUNDS OF THE ABDOMINAL WALL—INCLUDING UMBILICAL, VENTRAL AND INGUINAL HERNIÆ.

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Stetson Hospital

My experience with the method of overlapping the aponeuroses in the closure of wounds of the abdominal wall has given such admirable results in the prevention of post-operative hernia that since 1896 I have been an enthusiastic advocate of this method of closure as applied to all wounds of the abdominal wall no matter what their location, provided drainage was not employed. As at the present time the use of this method of closure of abdominal wounds is becoming more general, it may prove of interest if I give the development of the method in my own practice and also in the hands of others.

An article by Dr Kenelm Winslow appearing in the February, 1904, number of the ANNALS OF SURGERY, entitled "The Aponeuroses the Supporting Structures of the Abdominal Wall, their Approximation for the Prevention and Cure of Herniæ," has stimulated me to write this paper, although pressure of other duties has delayed its appearance. After discussing the employment of the principle of overlapping the aponeuroses in the cure of hernia, Winslow advocates, as a novel proposition, the adoption of the same principle as a routine procedure in the closure of ordinary celiotomy wounds, which theoretically he states should lead to improved results. This article shows that all general surgeons are not informed concerning the development of the operation of overlapping the aponeuroses in the closure of wounds of the abdominal wall and the results secured by it and indicates that an additional contribution to the subject may be of real value at this time.

Prior to May, 1892, I had employed the through-and-through silkworm-gut suture in the closure of celiotomy wounds. The high percentage of hernia following this method, especially in fat women, led me to abandon the method in favor of the tier suture. Following the principle of Schede of Hamburg<sup>1</sup> and Edebohls, I adopted the use of the buried permanent suture. Schede began the use of the buried silver-wire suture in May, 1887, more especially in the cure of large herniæ. The general surgical and the gynecological departments of the Johns Hopkins Hospital also had made extensive use of silver wire as a buried permanent suture. Edebohls<sup>2</sup> first employed silkworm-gut as a permanent buried suture in June, 1891, in the cure of a large umbilical hernia, and in May, 1892, he adopted the tier suture as a routine procedure, burying one row of silkworm-gut at the plane of the aponeurosis and then closing the skin and fat with a superficial row. I adopted Edebohls' technique and used it with but few changes until the end of 1896 for all wounds of the abdominal wall, including the Alexander operation, inguinal hernia and nephrorrhaphy. The changes consisted in substituting light for heavy silkworm-gut and in closing the subcutaneous fat and skin with catgut. The results secured by this method were eminently satisfactory as to primary wound healing, the prevention of hernia, and the absence of late irritation from the buried sutures, none of which gave trouble<sup>3, 4</sup>.

In spite of this satisfactory experience, several considerations induced me to abandon the Edebohls technique and to devise the method of overlapping the aponeuroses as a routine operation. These considerations were. First, the advantages of closing the peritoneum with a running catgut suture, second, the advantages of a mattress suture in relieving tension, and third, that by special preparation of the aponeuroses and the overlapping of these structures a surface to surface union of the aponeuroses could be substituted for an edge to edge union, which promised to add materially to the strength of the resulting cicatrix. The advantages of the mattress suture and the overlapping of the aponeuroses first became apparent to me in operating for a large umbilical hernia in a stout woman April 7, 1894. Mattress sutures were intro-

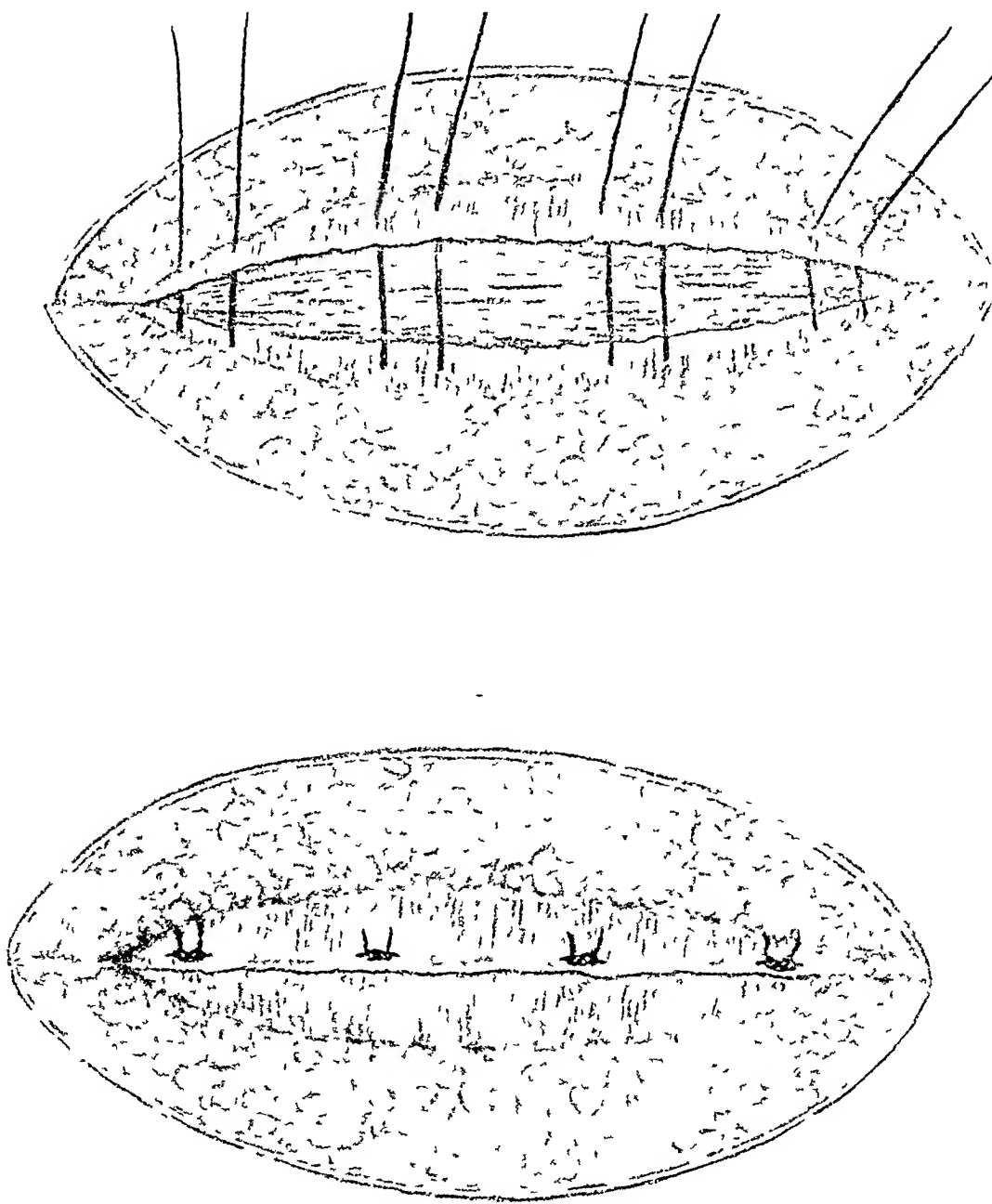


FIG. 1 — Modified mattress suture for closing the aponeurosis with silkworm gut



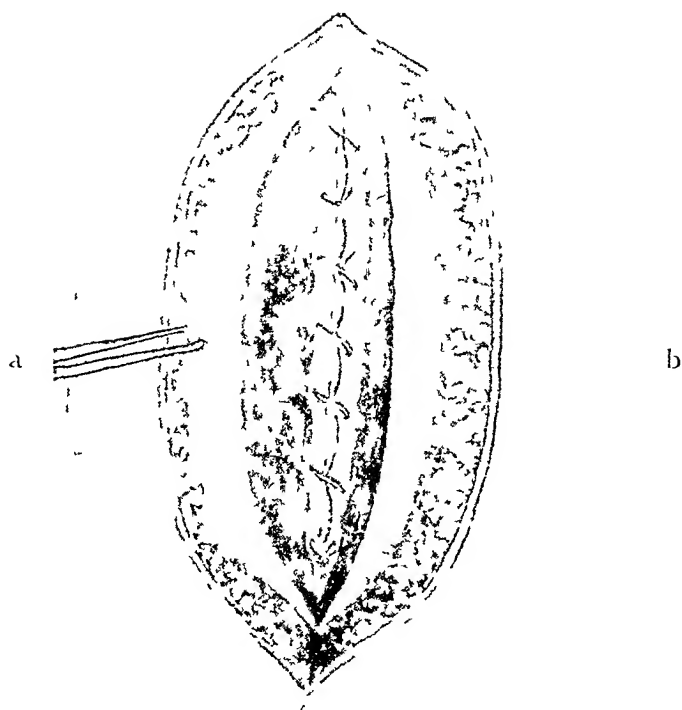


FIG. 2—Closing the abdominal wound.—1 Suture of the peritoneum with a fine running cumol catgut suture, 2 Preparation of the aponeurosis for suturing (a) Separation of the right aponeurosis from the rectus muscle (b) Dissection of fat from the left aponeurosis

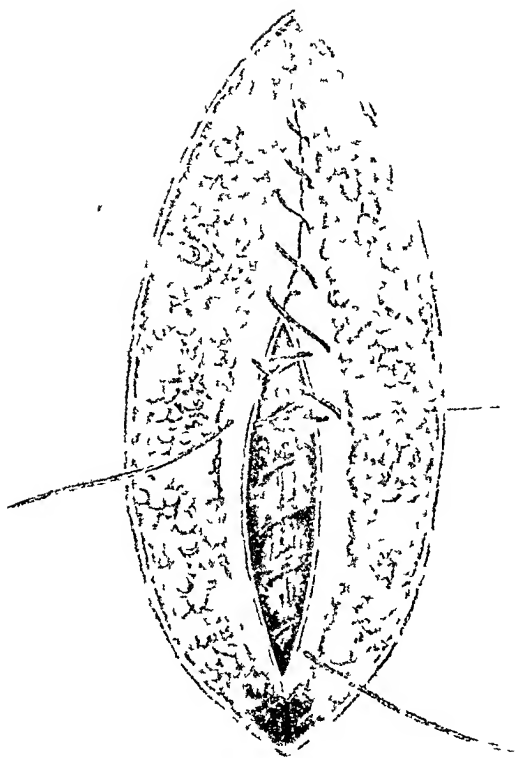


FIG 3—Closure of the wound in the aponeuroses of the oblique muscles. Overlapping the aponeuroses by superimposing that of the right side of the wound upon that of the left, and suturing with a continuous chromicized catgut suture.

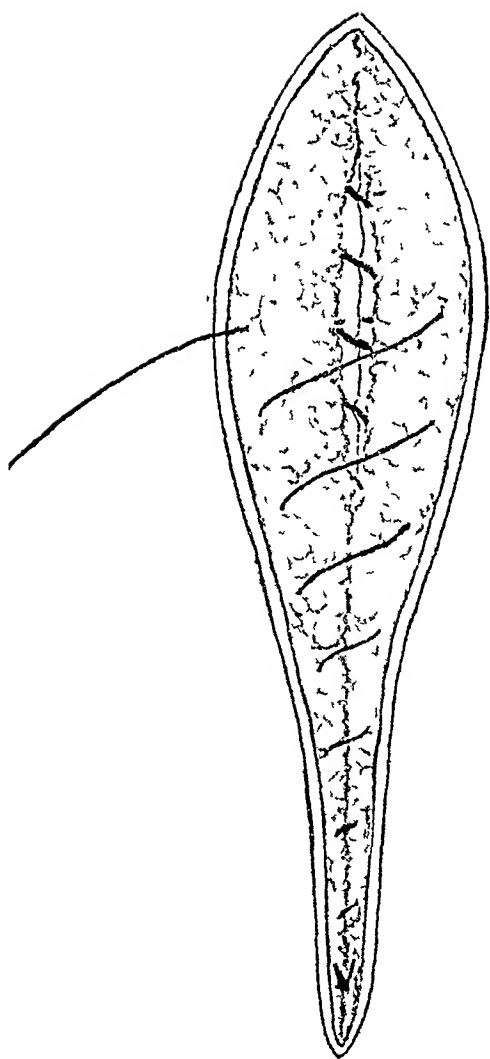


FIG 4 —Suture of superficial fascia and fat layer

duced primarily for the purpose of taking off tension from those introduced in accordance with the Edebohls technique, but it was evident to me that an additional advantage was gained in the extent of surface of the aponeuroses which was brought into apposition. The method was used occasionally from that date until it was adopted as a routine procedure at the end of 1896, especially in cases in which considerable tension was to be overcome.

It is now so generally accepted that the chief strength of the abdominal wall as a supporting structure depends upon the aponeuroses that we will not take time in demonstrating this proposition. It is equally accepted that the chief cause of post-operative ventral hernia is defective union of the aponeuroses, leading to separation of the edges of the aponeuroses and the development of hernia. The question which presented itself to my mind was whether an improvement could be made in securing aponeurotic union over that obtained by the methods in use in 1896. I had used the tier suture after the Edebohls technique with interrupted silkworm-gut suture, and was familiar with his later technique involving the use of the continuous catgut suture<sup>5</sup>. It was clear to me that the aponeurotic union secured by these methods consisted in a scar of about one line in thickness between the divided edges of the aponeuroses, provided accurate union throughout the length of the wound was secured. It seemed to me that a much stronger union could be obtained by substituting a surface to surface union for an edge to edge union, therefore the method was devised<sup>4</sup> and after various changes is now carried out as follows for celiotomy wounds.

The incision in the hypogastrium for operations on the female pelvic organs may be taken as the type. This incision is made by choice through the inner border of the right rectus muscle. In closing the wound the peritoneum is first closed with a continuous suture of fine cumol catgut. The fat is then dissected from the upper surface of the aponeurosis of the transverse muscles on the left side of the wound from one-third to one-half inch. The aponeurosis upon the right side of the wound is then separated for an equal distance from the rectus muscle. The muscles and fasciæ are then sutured

by means of a medium weight chromicized catgut suture in the following manner The suturing is begun at the lower angle of the wound upon the left side The suture is passed from above downward through the aponeurosis and rectus muscle Then the separated bundles of the rectus muscle are united with a continuous suture until the upper angle of the wound is reached, when the suture is passed from below upward through the aponeurosis upon the left side of the wound The suture is then passed from below upward through the aponeurosis upon the right side of the wound, and an additional suture is taken above this point to fix the suture and take the strain off that part which has brought the muscle in apposition The aponeurosis is then closed from above downward by catching the aponeurosis from the left side of the wound after the manner of the Lembert intestinal suture, and then passing the needle from below upward through the aponeurosis upon the right side of the wound When this suture is drawn taut, it slides the aponeurosis of the right side of the wound upon the aponeurosis on the left side of the wound The process is repeated until the lower angle is reached, when the two ends of the suture are tied In long wounds two or more mattress sutures are placed to take tension off the lines of continuous suture The fat is closed with a continuous suture of fine cumol catgut The skin is closed with fine cumol catgut suture by the intracuticular method When median wounds are long, extending near or above the umbilicus, care is taken to unite the posterior aponeurotic sheath of the rectus muscle with the peritoneum<sup>6</sup>

The method was at once used for all wounds of the abdominal wall, including herniotomy wounds, modifying slightly the operation in accordance with the anatomical conditions to be dealt with In the beginning mattress sutures of silkworm-gut were used to close the aponeurosis Since introducing the method, I have used it constantly, modifying the details somewhat, but never the principle involved

In 1898 silkworm-gut mattress sutures were abandoned and a continuous chromicized catgut suture for the rectus muscle and for the aponeuroses was substituted<sup>7</sup> With the adoption of catgut it became feasible to make some further

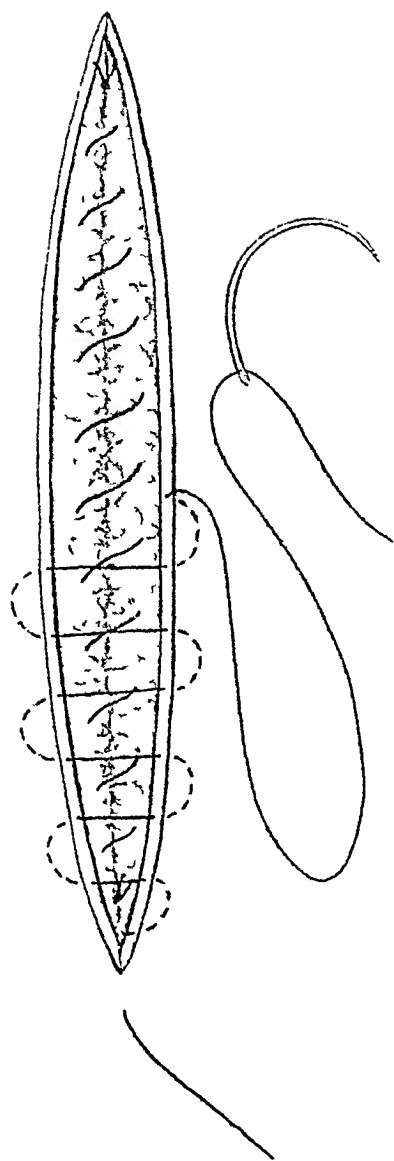


FIG. 5 — The subcuticular suture of the skin

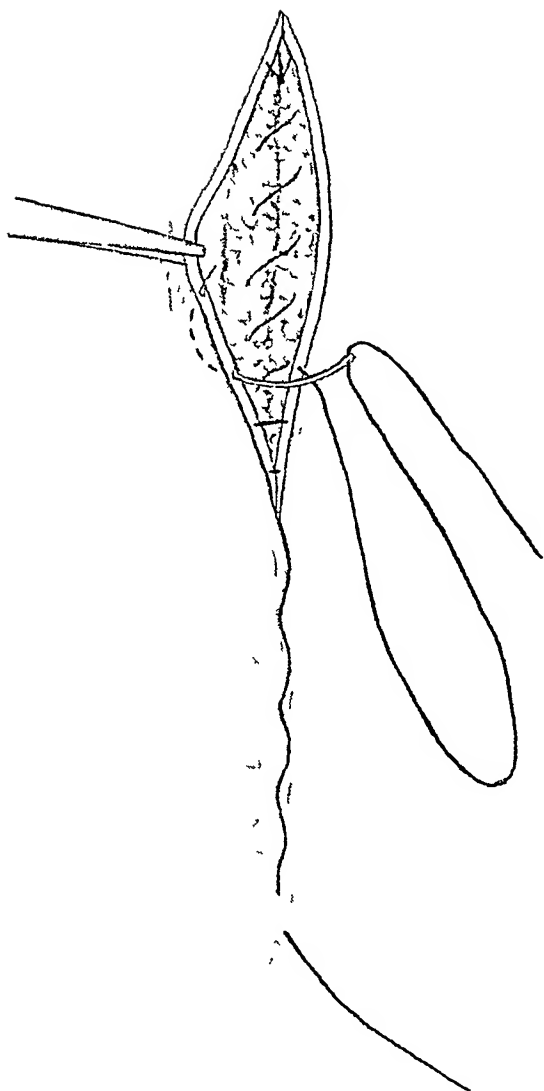


FIG 6 —Skin wound partly closed by subcuticular suture

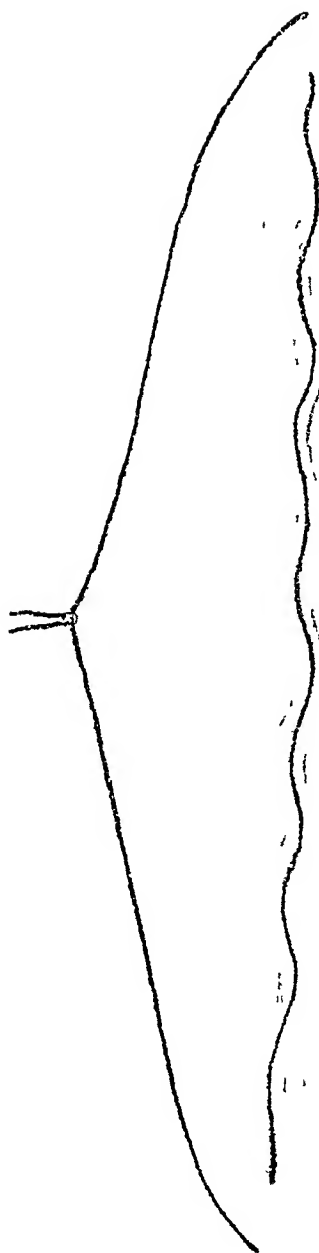


FIG 7—Final closure of skin wound



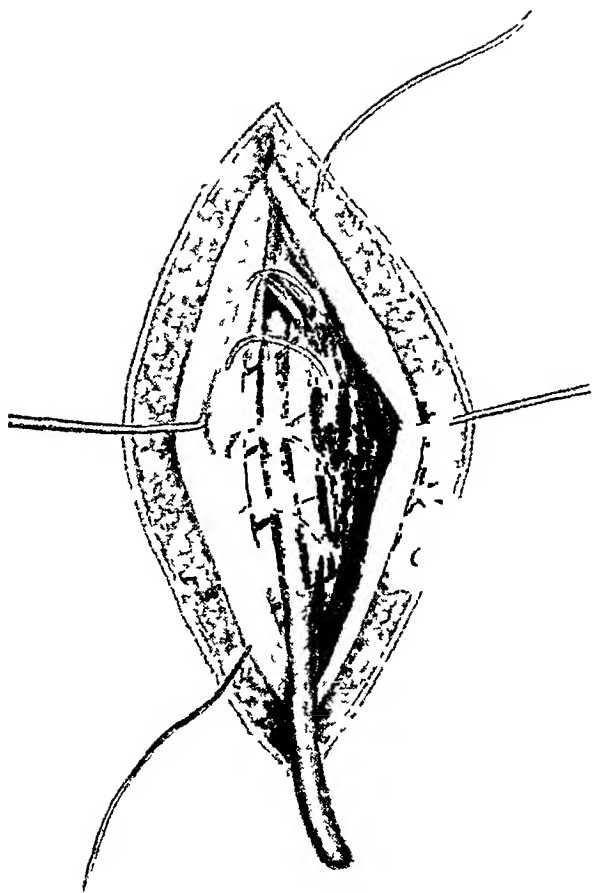


FIG. 8.—Shortening the round ligaments. Suturing the internal oblique round ligament and Poupart's ligament with chromicized catgut, to fasten the ligament and obliterate the canal.

improvements in the method Care was taken to suture the posterior sheath of the rectus muscle together with the peritoneum when the median incision was high enough to divide that structure In operating for appendicitis the incision through the outer border of the rectus muscle was adopted, and a fine chromicized catgut suture was employed to close the posterior sheath of the rectus together with the peritoneum In this way not only the anterior but the posterior aponeuroses were carefully united The same method of suturing was employed for inguinal hernia and for Alexander operations <sup>8, 9</sup>

Having traced the development of the method of overlapping the aponeuroses in its general aspects, a reference to some of its special applications is in order My original paper, "A New Method of Suturing the Abdominal Wall in Celiotomy" (1897), opens with the following paragraph

"I desire to report a new method of closing the wound in celiotomy, which I believe will give good results in all cases, and will enable the surgeon to deal successfully with cases of diastasis of the recti muscles, which heretofore have been most difficult to cure"

Since that time the method had been employed repeatedly for the cure of diastasis of the recti, and so far as is known in no case has there been a recurrence or the development of a ventral hernia I am satisfied that the method by overlapping the aponeuroses will give better results than that proposed by Webster in 1900 <sup>10</sup>

In the cure of herniæ the method of overlapping the aponeuroses is especially important and valuable As already stated, it was first employed by myself in the closure of an umbilical hernia in 1894 Since that time the method has been employed in almost all operations for hernia, whether umbilical, ventral or inguinal In operations for umbilical hernia at times there is less tension when the aponeurosis is overlapped from above downward instead of from side to side If good surface-to-surface aponeurotic union can be secured, a permanent cure will be effected even though the recti muscles remain separated I first made use of the plan of overlapping

the aponeuroses from above downward February 14, 1898 In this case it was impossible to approximate the recti, and as there was far less tension from above downward than laterally the transverse suture was adopted This method of operating upon umbilical hernia has been largely employed by W J Mayo, who first reported upon its use in 1898<sup>11</sup> In this paper, after describing the method of overlapping which he had employed, he states that it was similar to my method of closing celiotomy incisions Since that time Mayo has made two further reports upon the cure of umbilical hernia by overlapping the fasciæ, and has especially recommended the overlapping from above downward<sup>12, 13</sup>

The principle of overlapping the aponeurosis in the cure of inguinal hernia was first applied by Lucas-Championnière in 1892 or earlier<sup>14</sup> In 1901, in his brochure on the radical cure of inguinal hernia,<sup>15</sup> he reported a series of seven hundred and fifty-nine operations It is not necessary in this connection to discuss the methods used by Championnière in dealing with the sac and the inguinal canal itself The question of particular interest is his method of dealing with the aponeurosis He devised what he calls a U-shaped suture, which is a modified mattress suture, by means of which he overlapped the outer segment of the aponeurosis upon the inner segment, and then by means of interrupted sutures made the approximation neat I can find no indication that Championnière employed the principle of overlapping the aponeuroses otherwise than in the cure of inguinal hernia, and must therefore conclude that he failed to appreciate its value in the closure of celiotomy wounds in general The method of suturing which he used accomplishes the overlapping of the aponeurosis very satisfactorily, but it is much more complicated and more tedious in its application than the method which I have devised

E Wyllys Andrews was the next surgeon to make use of the principle of overlapping the aponeurosis in the cure of inguinal hernia He called the method which he devised the "imbrication or lap joint method"<sup>16</sup> He refers to the work of Championnière, which he regards merely as an improvement on the usual method of closing the inguinal canal His own operation accomplishes two purposes, first, the overlapping

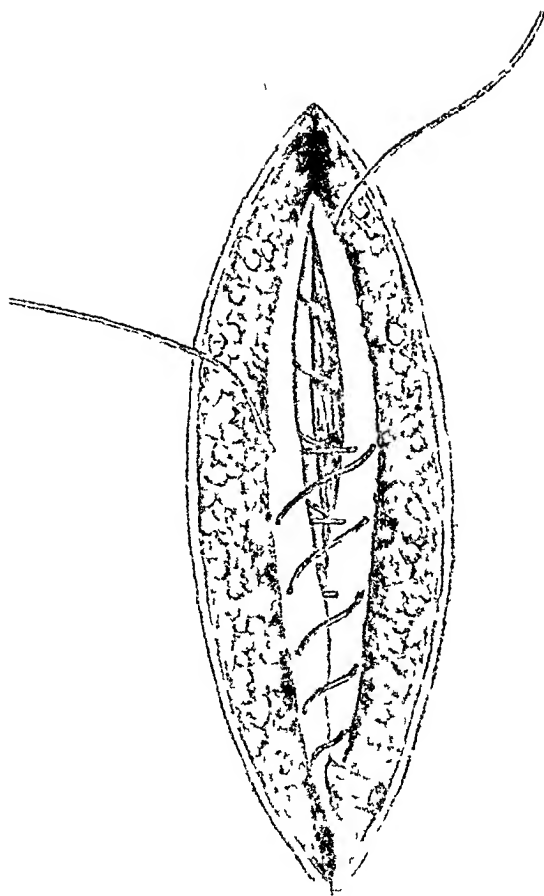


FIG 9—Overlapping the aponeurosis of the external oblique in closing the inguinal canal

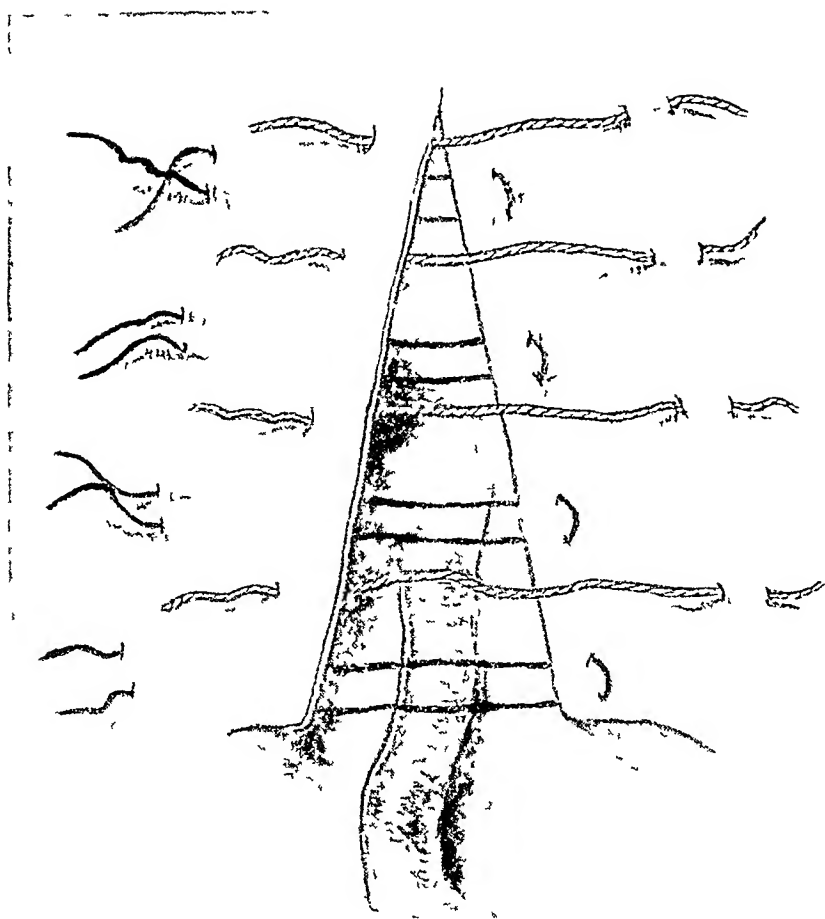


FIG 10—Championnière's method of overlapping the aponeurosis of the external oblique—inguinal hernia. Showing U sutures and interrupted sutures in place.

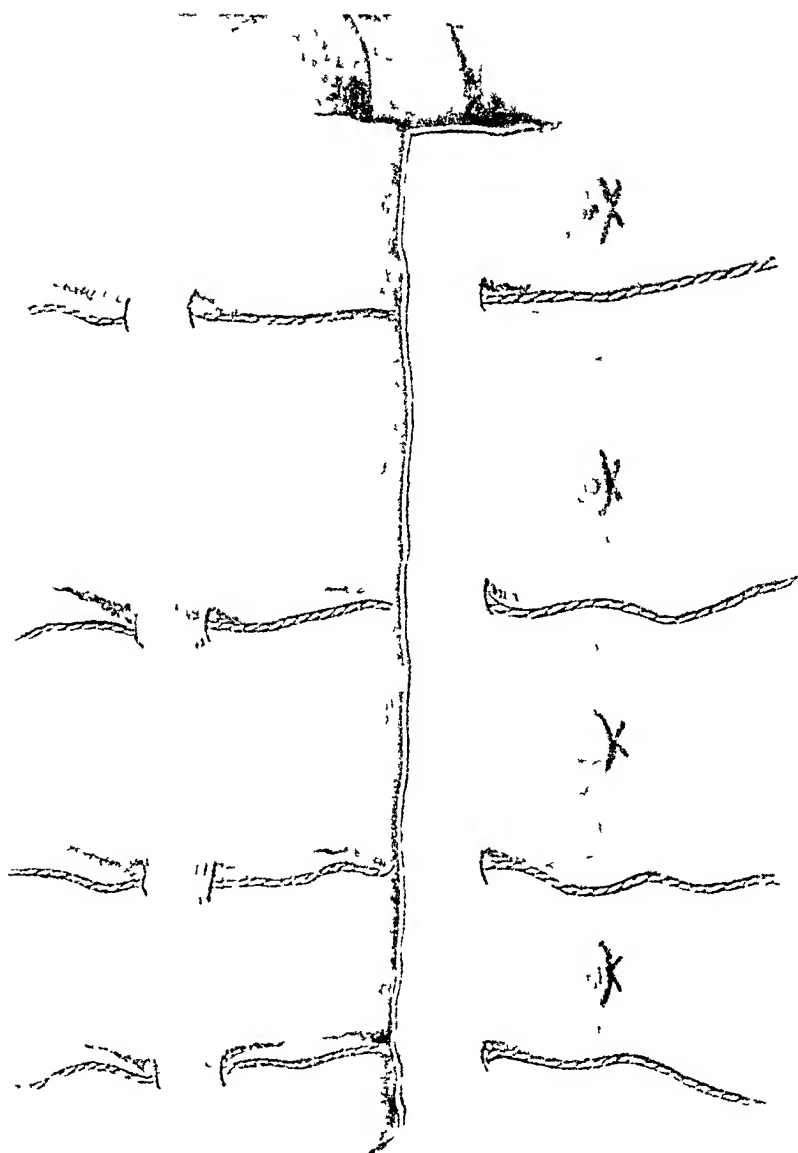


FIG 11—Champromiere's method—showing the U sutures tied and the interrupted sutures in place for tying



of the aponeurosis, and second, the transplantation of the cord into an artificial canal. He sutures the inner layer of the aponeurosis to Poupart's ligament behind the cord. The outer layer of the aponeurosis is then sutured above the cord to the inner layer. From the standpoint of the more general use of the principle of overlapping the aponeuroses, Andrews' article is of special interest, as he states that "the principle of imbrication or overlapping the several aponeurotic layers of the abdominal wall may enter into other abdominal operations to advantage, as I have repeatedly shown." In a second article on the radical cure of hernia,<sup>17</sup> in 1897, after discussing his own and other methods for the cure of inguinal hernia, he concludes with the following



FIG 12 —Andrews' imbrication or lap-joint operation for inguinal hernia

"I can not refrain from stating that I have found the principle of imbrication applicable to other purposes such as uniting abdominal wounds after ordinary celiotomy near the linea alba and linea semilunaris, but in this part of the subject I cannot hope to interest you at the present time."

It is thus evident that Andrews appreciated the value of the principle in suturing all wounds of the abdominal wall, and therefore it is probable that he made more or less systematic use of it.



If this paper were a study of the development of the radical cure of inguinal hernia, it would be necessary to refer to the operations of Bassini, Halsted and others, but with its actual limitations it is only of interest to point out that in the Johns Hopkins clinic practical experience showed the limitations of the original Halsted operation with the typical mattress suture. Bloodgood tried to meet the necessities of the case in large herniæ by transplantation of the rectus muscle and by use of the sheath of the muscle to take the place of the conjoined tendon<sup>18</sup>. Halsted<sup>19</sup> still later reports that in certain cases he makes a flap from the cremaster muscle, which is sutured to the under side of the internal oblique muscle. The conjoined tendon and the internal oblique are sutured to Poupart's ligament, and then the aponeurosis of the external oblique is overlapped. Halsted states that this is known as the Andrews method, although devised independently by him.

My own work in the cure of inguinal hernia has been incidental to that in abdominal surgery in general and gynecology, and I have never devoted special study to the closure of wounds of the inguinal canal, whether for inguinal hernia or the Alexander operation. In operations for inguinal hernia in women the Bassini operation has been done, with overlapping of the aponeurosis of the external oblique. In the Alexander operation the same technique has been followed, with the exception that the round ligament has been included in the sutures which unite the internal oblique to Poupart's ligament. In addition, I frequently place a mattress suture of silkworm-gut at the internal ring in hernia operations to reinforce this point—the suture entering the external oblique, passing through the internal oblique, through Poupart's ligament, and then back through the internal and external oblique. This suture is tied after the canal is closed in the usual way.

In my own work the development of the principle of overlapping the aponeuroses in the closure of wounds of the abdominal wall grew out of my experience with the other methods of closure previously used, and was the natural consequence of recognizing the shortcomings of these methods. The application of the principle to the cure of inguinal hernia, to the cure of umbilical hernia, and to the cure of diastasis of

the recti muscles, was a natural development from the use of the principle in the usual celiotomy wound, and for operations for appendicitis and for movable kidney. I was not aware of the work of Championnière and Andrews in the cure of hernia, as not being a general surgeon and having no occasion to operate for inguinal hernia in men, I had given no critical study to the special literature concerning inguinal hernia.

It is quite clear that to Championnière is due the credit of having first appreciated the advantages of overlapping the aponeuroses, apparently, however, he did not realize that the principle had any application elsewhere than in the inguinal canal. With Championnière's work as a basis, Andrews developed a special technique for the cure of inguinal hernia, and also more fully appreciated the importance of the principle, as shown by the references already given to his articles, in which he claims that the method can be applied with advantage to the usual celiotomy wounds. It is evident that the process by which Andrews arrived at this opinion was exactly the reverse of my own experience. A realization of the advantages of the method in the special operation for the cure of inguinal hernia suggested its employment in all other abdominal wounds, whereas, in my own work the appreciation of the advantages of the method in the closure of abdominal wounds in general led to its employment in the special operations on the inguinal canal.

The best evidence which I can give as to the practical merit of the method in the prevention of post-operative hernia is the fact that during the nine years in which the method has been in use, but a single patient has presented herself with post-operative hernia. Others may have occurred of which I have no knowledge, but it is quite clear that post-operative hernia plays an unimportant rôle when the aponeuroses are overlapped in the closure of celiotomy wounds.

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# FOREIGN-BODY PSEUDO-TUBERCULOSIS OF THE PERITONEUM.

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PSEUDO-TUBERCULOSIS, a term coined by Eberth in 1885, has widened in its application so as to include under its designation all conditions which anatomically resemble genuine tuberculosis, whatever their etiology

Ophuls, in a valuable survey of this subject in the Reference Handbook of Medical Sciences, Vol VI, page 778, adopts the following etiological classification

1 Pseudo-tuberculosis caused by the bacillus Pseudo-tuberculosis Rodentium Two not altogether convincing instances of human infection are reported in this connection

2 Pseudo-tuberculosis caused by a bacillus resembling the bacillus of Pseudo-tuberculosis Rodentium Du Cazal reports two such cases, in one of which nodules the size of a hazelnut were found on the surface of the peritoneum, in the pancreas and liver Wrede records another instance of such infection in which miliary nodules were found on the peritoneum, as well as in other localities The causal bacillus possessed acid fast staining properties

3 Pseudo-tuberculosis caused by other bacilli, as, *e g*, bacilli resembling the Diphtheria bacillus

4 Pseudo-tuberculosis caused by filamentous bacteria Eppinger records a case of brain abscess Flexner, under the designation of Pseudo-tuberculosis Hominis, reports an instance in which tubercular-looking lesions were found in the lungs and tubercle-like nodules in the peritoneum A streptothrix was apparently the pathogenic germ

5 Pseudo-tuberculosis caused by mould fungi, *e g*, pigeons' pseudo-tuberculosis due to the aspergillus mould Several instances of human mould infection are on record

6 Pseudo-tuberculosis produced by the organism of *Blastomycetes Dermatitidis*

7 Pseudo-tuberculosis produced by the fungus *coccidioides* Here the combination of the miliary abscess and miliary tubercles may be very bewildering, as Ophuls has pointed out

8 Pseudo-tuberculosis caused by animal parasites and their eggs

9 Pseudo-tuberculosis produced by dead foreign bodies

The first seven varieties are mainly of interest to the physician, and are becoming clinically more important, since the list of reported cases of lung disease is constantly lengthening, in which symptoms and physical signs suggestive of tuberculosis may occur, together with acid fast bacilli in the sputum, and yet the ailment be non-tubercular in origin. Some of these cases, however, are only clinically pseudo-tubercular, the underlying pathologic lesion not resembling genuine tuberculosis. From what has been said, it will be seen that if the peritoneum be involved in these varieties, it occurs in association with similar lesions elsewhere, and serious errors in intra-abdominal operative work are not apt to occur. The last two varieties, however, possess a special significance for the surgeon, as the following cases will show

Helbing, in the *Berl klin Wochenschr* 1899, page 714, records as follows. A laparotomy was performed for perityphlitis. Tubercles were seen on the omentum and cæcum. A piece of omentum was removed. With the endeavor to demonstrate the tubercle bacillus, sections were made and suitably stained. In place of the bacillus, the eggs of the tænia worm were found occupying the center of the nodules lying among the giant cells. Helbing ascribes the lesions to the escape of these eggs from a perforated appendix, they acting as chronic localized peritoneal irritants. He credits Miura, of Tokio, with a similar observation, but omits the reference.

Carl Meyer, in the *Beitr z Pathol Anat u Allegem Pathol* xiii, 1, 1903, reports a case of a woman who had had an abdominal tumor for some years. A few weeks previous to her entrance to the hospital it had evidently ruptured. There was now free fluid in the peritoneal sac. Examination of the aspirated fluid showed cholesterol crystals and red blood cells. Laparotomy demonstrated an ovarian cyst, many peritoneal miliary tubercles, and in their neighborhood fibrinous masses. Macroscopic examination of tissue removed resulted in the diagnosis of a

dermoid ovarian cyst and tubercular peritonitis. Microscopic investigation, however, revealed the true nature of these little bodies, they were pseudo-tubercles. In their center were giant cells, and amongst the giant cells, and in some instances enclosed in these cells, were cholesterol crystals. The diagnosis was then changed and naturally—an all important point for the patient—the prognosis. Meyer then refers to several instances of pseudo-tuberculosis of the conjunctiva and iris due to the irritation and enclosure of little hairs, and to experiments showing the formation of giant cells around wound ligatures. He records two other extremely interesting cases.

The first (Von Recklinghausen) concerns a woman who died from pneumonia several months after being laparotomized. A disseminated tuberculosis of the abdomen was found. Microscopic examination of the tubercles, however, showed that it was another instance of foreign-body pseudo-tuberculosis, little pieces of sponge left behind in the abdomen at the time of the operation being found within the nodules.

In the second case, first reported by Hanau in the *Correspondenzblatt für Schweizer Aerzte Jahrbuch*, xxi, a man who had had typical symptoms suggestive of gastric ulceration for upwards of five years, was seized twelve days previous to his death with epigastric pain, accompanied by fever. Postmortem revealed a large ulcer saddling the lesser curvature and this had perforated, in the adhesions round about and in the neighboring peritoneum were numerous miliary tubercles. Though the ulcer looked to be of a simple nature, it was suspected to be carcinomatous, these little nodules being regarded as possibly metastatic, more particularly as there was no possible primary tubercular focus except a partially calcified bronchial gland. Microscopic examination demonstrated that the little bodies were pseudo-tubercles and that amongst the giant cells were enclosed little remnants of vegetable food. The ulcer was non-malignant in character.

Dévé (*Revue de Chirurgie*, July, 1902, page 67), in an article entitled "Des Cholérages Internes," collates thirteen instances of "Cholépéritoine Hydatique." Amongst these thirteen are four in which pseudo-tuberculosis of the peritoneum had occurred. The causal irritants were the hydatid hooklets or small pieces of hydatid membrane. In one case (De Quervains, reported in the *Centralt f Chir* 1897, No 1), much difficulty in diagnosis resulted, even though the ascitic fluid was bile-stained. In another case (Debove and Soupault, *Soc méd des hôp*, 9th Dec, 1902, et 19th October, 1894), an actual error was made and the abdomen closed in consequence. Dévé's description of these tubercles is so clear that I quote him in full. He says:

These pseudo-tubercles are commonly of the size of a pin-head or millet-seed, they are whitish or translucent. Macroscopically they are often indistinguishable from genuine miliary tubercles, and appear as though modelled after these lesions. They may occur over the parietal or visceral peritoneum or in the omenta. They are covered by the peritoneal endothelium and appear as though embedded in the subendothelial peritoneal cellular tissue. By introducing under them the taut finger they are rendered more salient. Microscopically, they may resemble miliary tubercles even down to the finest histological detail. Many multinucleated giant cells are present in the centre of these newly-formed little nodules. The giant cells are surrounded in their turn by a mixed layer of epithelioid and round cells. But characteristic or pathognomonic of these pseudo-tubercles are the causal irritants which are found lying amongst the giant cells. In the cases collated by Deve pieces of laminated hydatid cyst membrane, or the characteristic hooklets, were thus included. Calcification even may take place in some of the nodules. He draws particular attention to these bodies and notes the absence of all allusion to them in French books, and the liability of the surgeon to diagnostic error. He believes their formation to be a protective process and remarks that they may occur on other serous membranes than the peritoneum. Thus he quotes Lehne who recorded a similar pseudo-tuberculosis of the medullary meninges occasioned by the rupture of an hydatid cyst of the spinal column. He further adds that not all the little bodies found in the cases he records were of the nature described above, some being the early stage of secondary hydatid cyst development.

The non-tubercular origin of these little structures is convincingly established, for tubercle bacilli can neither be demonstrated in section, by culture, or by guinea-pig inoculation, and, moreover, the characteristic lesions can be, and frequently have been, produced experimentally by the injection of tubercle free foreign bodies. Thus, Wallenburg produced such lung pseudo-tubercles by intra-tracheal injection of droplets of metallic mercury. Dévé produced them in rabbits by the injection of hydatid scolices, etc.

I have not been able to find any record of similar cases in English or American literature, but in Rolleston's "Diseases of the Liver, Etc.," in the discussion of the results of intra-peritoneal rupture of liver hydatid cysts, brief mention is made of these pseudo-tubercles, and Dévé's article referred to, whilst in Herman's "Diseases of Women," page 776, the following pregnant paragraph is to be found: "The question has been raised but never settled, as to those cases in which the

peritoneum is studded with little bodies looking and feeling like miliary tubercles,—whether these bodies are really the product of the tubercle bacillus? In the cases that recovered there is no evidence for or against ”

The following history is of interest

A B, a middle-aged plump woman was admitted into the German Hospital under the care of Dr Jellinek, to whom I owe the privilege of seeing the patient and reporting the case. She was a feckless individual and gave a very unsatisfactory history. We eventually learned that she had been seriously ill for six weeks, and that her illness had begun acutely with pain in the lower abdomen, which she insisted upon ascribing to coition vaginal injury. There was no temperature, the face was pale, the pulse quick and feeble, there was marked aversion to food, but no vomiting, and no obstruction symptoms. Her bowels were reported to have moved the day previous. The lungs were normal. The heart sounds were feeble, but no murmur was audible. Examination of the nervous system was negative. The abdomen was well clothed with fat, was somewhat distended, and over the right ovarian region a linear scar was present. There was no rigidity of the abdominal wall, but some tenderness was evident on slight pressure over the bladder region. The liver and spleen were not palpable. The percussion note was dull, and free fluid was present in the peritoneal cavity. Posteriorly, there was dullness to percussion up along the ascending colon, and a slight filling out of this area when compared with the corresponding region of the opposite side. Vaginal examination revealed some thickening of the left tubo-ovarian structures. Rectal examination was negative. The urine, small in amount, gave a Diazo reaction, but was otherwise normal. The leucocytes numbered 12,000 per c m, 70 per cent being of the polynuclear variety.

In view of the acute onset, her clinical aspect, the leucocytosis, and the post colonic dullness, I believed her to be suffering from a sub-acute infective peritonitis with a localized post-colonic collection of pus, due to a diseased tube or appendix, rather than from a tubercular peritonitis, which appealed to us as the most likely alternative diagnosis. She was referred to the



surgical side and her abdomen opened. A large quantity of brownish serous fluid was evacuated. The intestines and peritoneum that presented were seen to be covered with innumerable miliary tubercles, though (and we would emphasize the point) no matted fibrous bands or enlarged glands were evident. A diagnosis of tubercular peritonitis was made, the abdomen emptied of fluid as far as possible and then closed. The patient continued to weaken and shortly died. Even after the operation I could not correlate her appearance and the clinical findings with an uncomplicated tubercular peritonitis, and so sent her to the postmortem room with a diagnosis of tubercular peritonitis as discovered at operation, plus a peritoneal infection. At the autopsy, made by Dr. Ophuls, the small miliary tubercles were much in evidence, being present over the general peritoneum. The intestines were somewhat matted together by recent fibrinous adhesions. There were no old fibrous bands and no abdominal glandular enlargement. The appendix was normal and there was no pelvic infection. The post colonic dullness was due to a localized collection of pus. Examination of the stomach showed a large perforated gastric ulcer saddling the lesser curvature and small carcinomatous nodules were present in the liver, which, however, was not enlarged and was well up under the rib margin.

The macroscopic examination thus revealed

- 1 Subacute septic peritonitis secondary to a perforation of a gastric ulcer as the immediate cause of death

- 2 Small carcinomatous nodules in the liver

- 3 Small miliary tubercles in the peritoneum which, from their naked-eye appearance, might be (1) Miliary tubercles, (2) miliary carcinomata, (3) pseudo-tubercles. No primary tubercular focus was present. They were thus probably either carcinomatous or pseudo-tubercular.

Microscopic examination by Dr. Ophuls, to whom I am much indebted for the report, demonstrated that the gastric ulcer was carcinomatous in nature and that the peritoneal nodules were pseudo-tubercles containing no bacilli, but showing in their interior little food particles, which were surrounded by giant cells, they thus corresponding to the pseudo-tubercles found in Hanau's patient.

The record of this patient is extremely instructive, inasmuch as the history (true an imperfect one) did not suggest any ailment of the stomach. Moreover, all symptoms were referred to the lower abdomen, and the few clinical signs present pointed to a lesion in that vicinity. Looking back, I believe that in the absence of a reliable history my original diagnosis should have read, "Sub-acute septic peritonitis plus a retro-colonic abscess—origin uncertain," thus leaving the further elucidation to the operating surgeon. I had seen, some years previously, a patient in whom a tentative diagnosis of tubercular peritonitis had been made. Sudden collapse took place and death ensued. The autopsy showed a gastric ulcer which had evidently perforated, had been occluded by the omentum and then reperfected, causing the fatal collapse. In that patient there were, similarly, no symptoms or signs referable to the stomach, but then the ulcer was occluded till just a few hours previous to death. In this case, however, the perforation was a large one and there was no indication of any such occlusion.

From this case history and the history of the collated instances of pseudo-tuberculosis, we learn that exploration of the abdomen should be thorough, and that a too hasty operative diagnosis of tubercular peritonitis is to be avoided, more particularly if old fibrous bands or enlarged intra-abdominal glands be absent, otherwise avoidable fatalities may result. If the ascitic fluid be bile-stained, echinococcic pseudo-tuberculosis will be thought of, on the other hand, if fibrinous or pseudo-myxomatous masses are found in the abdominal cavity a ruptured ovarian cyst will be looked for, but though no free-food particles be recognizable as in the reported case, gastric perforation of some little standing cannot be definitely ruled out without an exploration of the upper abdomen. They further serve to once again draw our attention to a fact long recognized by pathologists, viz, that the demonstration of the tubercle bacillus by staining, culture or inoculation, is the only sure proof of its being a causal agent in the production of any lesion, however much that lesion may anatomically resemble genuine tuberculosis.

# SOLID TUMORS OF THE MESENTERY WITH REPORT OF A CASE AND A REVIEW OF THE LITERATURE

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ALTHOUGH within recent years a good many cases of solid tumors of the mesentery have been reported the condition is still sufficiently rare to attract the attention of medical men

Mesenteric tumors were described as early as 1803 by Portal, and classified by him as scirrhus, steatomatous, stony, cancerous and hydatid. He describes the diagnostic features clinically and points out the difficulty of differentiating between mesenteric and omental tumors. His work attracted very little attention, most probably because it was post-mortem. We hear nothing more of mesenteric tumors till 1880, when Tillaux reported a case of *cyst* of the mesentery successfully removed. In the same year Péan reported three such cases operated on by him, giving the diagnosis and treatment. In the next few years numerous cases of cysts were reported, but reports of solid tumors were exceedingly rare. So rare was this condition of solid tumors of the mesentery that Mr. Lockwood states that no such tumor had been exhibited to either the London Pathological or Medical Society prior to 1895. In 1897 Mr. Shield reported a case to the Medical and Chirurgical Society of London, at which time the subject was quite unfamiliar to that society. Douglas read a paper on this subject before the Southern Surgical and Gynecological Society in 1898, and no surgeon present had had any operative experience with these tumors.

Lipomata are said to be the most frequently found solid tumors, and these sometimes attain enormous size. Von Bergmann reports that Terillon removed one weighing 29 kg



FIG. 1—Gross appearance of tumor of mesentery

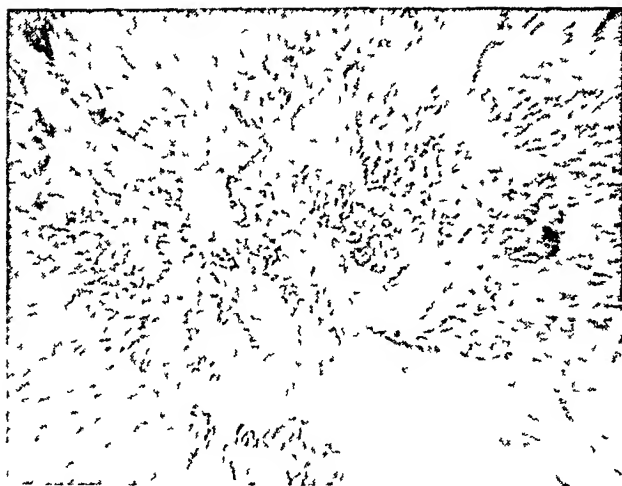


FIG 2—Sarcoma of mesentery Photo micrograph magnified 30 diameters

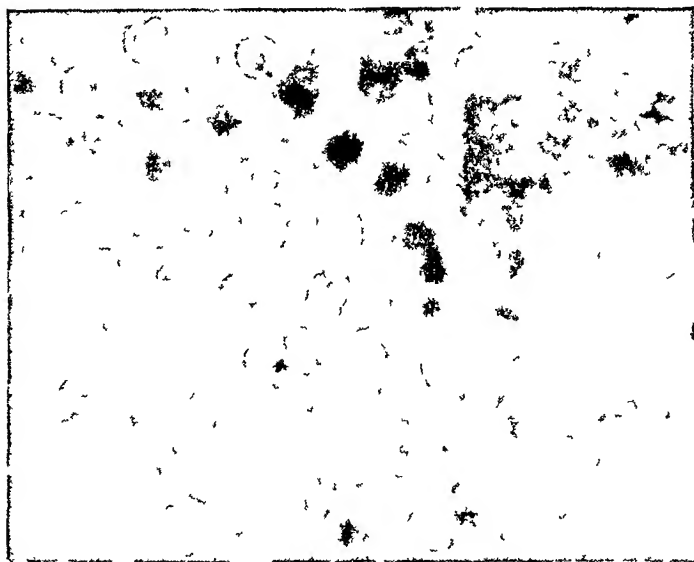


FIG 3—Sarcoma of mesentery Photo micrograph, magnified 425 diameters

(64 lbs ) Van der Veer had one of 28 kg and Péan another of 28 kg Waldeyer describes a lipomatous myxoma with metastases in the lungs and other organs, weighing 61 lbs Other primary tumors of the mesentery are fibroma, myxoma, enchondroma, teratoma, sarcoma, and adenoma, also mixed growths as fibro-lipoma, fibro-myxoma, fibro-myo-sarcoma, and lymphadenomata Carcinoma is said never to be primary but always secondary, as a metastasis to a primary lesion elsewhere This seems disproved by the case of primary carcinoma of the mesentery reported by Wanless in 1903 (see Case 22 of Table I)

The seat of these tumors is usually in the mesentery of the small intestine, but there are now several cases reported as seated in the mesocolon and sigmoid flexure As new cases are reported the formerly restricted lines of origin and kinds of growth are widened till it now bids fair to include all mesentery as field of origin and nearly all kinds of tumors as the bounds of the new growths The embryologic development of the mesentery makes this prediction likely if the embryonal theory of the origin of tumors amounts to anything

TABLE I—SOLID TUMORS OF THE MESENTERY

| Case | Reporter                                  | Sex | Age | Growth                                                                    | Previous History                                                                                                                                            | Operation                                                                                                                                             | Attachment                                                     | Resection                | Post Operative History                                                                                                         |
|------|-------------------------------------------|-----|-----|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1    | Dallmann Inaug Dissert Halle, 1903        | M   | 40  | Numerous nodular fibroid masses                                           | Constipation, bowels moving only by enemata Headache and intestinal indigestion Symptoms for 5 months                                                       | Incision from xiphoid to symphysis Large tumor removed with difficulty from mesentery alongside of vertebral column Drain and tamponade               | Mesocolon and mesentery                                        | None                     | Dismissed from hospital as cured on 26th day                                                                                   |
| 2    | Gildermeister Inaug Dissert Breslau, 1902 | F   | 22  | Fibroma with points of calcareous degeneration                            | Obstipation with vomiting, which became fecal three days prior to operation                                                                                 | Median incision and small tumor removed from front of vertebral column between folds of mesentery                                                     | By pedicle to mesentery                                        | None                     | Recovery in 20 days                                                                                                            |
| 3    | "                                         | F   | 30  | Spindle celled sarcoma                                                    | Pain and swelling in right side of abdomen Other symptoms negative                                                                                          | First Operation—Omentum adherent to tumor, which on separation opened an abscess from behind tumor Drainage Second Operation—Removal of entire growth | To mesentery with many adhesions                               | None                     | First Operation—Pus drained for several days Second Operation—Followed by complete recovery Some months between the operations |
| 4    | "                                         | F   | 8   | Angio sarcoma morphology of numerous semicircular dark red nodular masses | Taken suddenly ill 8 days previous to operation with pain in abdomen No vomiting or constipation                                                            | Tumor removed with adherent bowel No connection to reproductive organs                                                                                | Connected with mesentery but no where adherent except to bowel | 9 cm of healthy bowel    | Death on 9th day from exhaustion                                                                                               |
| 5    | "                                         | F   | 38  | Fibroma                                                                   | Premature birth one year ago, since which she noticed a movable tumor in the abdomen Pain, constipation and dyspnoea 3 months pregnant at time of operation | Tumor removed with adherent intestine Anastomosis with Murphy button                                                                                  | Mesentery and small intestine                                  | 35 cm of small intestine | Recovery                                                                                                                       |
| 6    | "                                         | F   | 33  | Fibroma                                                                   | Swelling in abdomen noticed for 4 years Severe pain and diarrhoea during last 3 mos                                                                         | Tumor very adherent, removed along with adherent intestine                                                                                            | Between folds of mesentery                                     | 23 cm of gut             | Recovery                                                                                                                       |





TABLE I—SOLID TUMORS OF THE MESENTERY—Continued

| Case | Reporter                                                              | Sex | Age | Growth                                            | Previous History                                                                                                                                                                                                                                                                              | Operation                                                                                                                                                                                                                                                                                   | Attachment                                                        | Resection | Post Operative History                                                                                                                                               |
|------|-----------------------------------------------------------------------|-----|-----|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15   | From Jahresb<br>u d chir Abt<br>d Spital in<br>Basel 1902<br>61       | F   | 40  | Sarcoma                                           | Complained for 4 months of<br>pain in left hypochondrium,<br>radiating from the navel<br>with gradual development of<br>tumor in middle of abdomen                                                                                                                                            | "Exploratory" Tumor<br>covered by mesentery<br>with great masses of con-<br>gested blood vessels<br>Small intestines pushed to<br>right and colon passing<br>over growth In pelvis<br>was a large quantity of<br>liquid blood and coagula<br>and fibrin Operation<br>could not be completed | Mesentery<br>with no con-<br>nection with<br>uterus               | None      | Death with post<br>mortem diagnosis<br>of "Sarcoma of<br>mesentery with in-<br>traabdominal<br>hemorrhage"                                                           |
| 16   | Kownatzki<br>Deutsch Milh<br>tar Zeits<br>chrift 1904,<br>XXXIII, 254 | M   | 24  | Tubercular tumor the<br>size of a child's head    | Pain in abdomen since April,<br>1903 Pain (May 5th, 1904)<br>localized to left of navel No<br>bowel trouble Fever con-<br>tinued from 13th to 15th,<br>and remitted till 20th Spleen<br>not enlarged leucocytes<br>6000 Anemia Hard, pain-<br>ful, slightly movable<br>tumor to left of navel | Abdomen opened over<br>tumor, but nothing more<br>done Three days later<br>wound was reopened and<br>on account of malignant<br>appearance of growth and<br>metastases in lungs wound<br>was again closed                                                                                   | Within the<br>mesentery                                           | None      | Death 2 days after<br>operation Au-<br>topsy Tubercu-<br>losis with metasta-<br>sis in liver, spleen<br>and lungs                                                    |
| 17   | "                                                                     | M   | 21  | Lympho - sarcoma<br>Tumor size of child's<br>head | Injured by falling from horse<br>Severe pain in pelvis when<br>admitted to hospital Next<br>few days had temp 38.6 C,<br>fainting spells, nose bleed,<br>meteorism, vomiting severe<br>abdominal pains, diarrhoea<br>and distended abdomen<br>Later constipation                              | Abdominal section for re-<br>lief of severe symptoms<br>Tumor not removed Ad-<br>herent to intestines, and<br>second lumbar vertebra                                                                                                                                                        | Mesentery<br>with exten-<br>sive intes-<br>tinal attach-<br>ments | None      | Death soon after<br>operation Ne-<br>cropsy showed<br>stomach and ileum<br>adherent to brain<br>like growth sur-<br>rounding pelvis of<br>left kidney and<br>ureters |
| 18   | Latouche Bull<br>et Min Soc<br>de Chir de<br>Paris 1900,<br>XXVI, 889 | F   | 53  | Lipoma                                            | Woman of large physique<br>and well nourished, pre-<br>sented all the symptoms of<br>an ovarian tumor Tumor<br>nodular no ascites                                                                                                                                                             | Removal of tumor                                                                                                                                                                                                                                                                            | Between folds<br>of mesen-<br>tery                                | None      | Recovery in 19 days                                                                                                                                                  |

|    |                                                                          | F  |    | Lobulated fibroma                                                                                                                |  | Began with abdominal pain 3 years ago, with enlargement of mesentery. Abdomen measures 85 cm in circumference                                                                                                         | Tumor removed Adhesions to intestines and epiploon                                                                                                                                                                                             | Mesolecum                                   | Of bowel involved            | Recovery                           |
|----|--------------------------------------------------------------------------|----|----|----------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------|------------------------------------|
| 19 | Duranona (L.)<br>Revista Med<br>Soc Med<br>Buenos Ayres<br>1901, IX, 499 | 42 |    |                                                                                                                                  |  | Of no interest                                                                                                                                                                                                        |                                                                                                                                                                                                                                                |                                             |                              |                                    |
| 20 | Candido, G<br>Anal. de Med<br>Naval Roma<br>1904, X, 303                 | M  | 26 | Lymphosarcoma                                                                                                                    |  | Tumor simulated cyst of ovary. Pelvic organs and kidney healthy                                                                                                                                                       | Removal of tumor through abdominal cavity                                                                                                                                                                                                      | Mesentery                                   | None                         | Death following operation          |
| 21 | Doran Brit<br>Med J 1904,<br>II, 1075                                    | F  | 34 | Fibroma, weight 30 lbs., undergoing myxomatous degeneration                                                                      |  | Swelling in abdomen first appeared 6 months ago size of a child's fist and rapidly increasing in size                                                                                                                 | Removed tumor of doughy feel extending in direction of stomach beneath the liver and transverse colon                                                                                                                                          | Retro peritoneal                            | None                         | Recovery                           |
| 22 | Wanless, W J<br>The Indian<br>M Gaz 1903,<br>XXVIII,<br>377              | M  | 14 | Colloid carcinoma. The wall of tumor was very thin and friable, discharging large quantities of amber colored gelatinous fluid   |  | Several weeks of increasing pain and discomfort in abdomen about a month before operation felt a "lump" in abdomen. Pain became very severe, with vomiting and great depression. Tumor size of man's head and movable | On opening peritoneum sero sanguineous fluid escaped. A dense, hard, slightly nodular tumor was found which had twisted the gut to right angles with its long axis $1\frac{1}{2}$ turns, forming a volutus with tightly twisted pedicle        | Mesentery of transverse and ascending colon | None                         | Death on 3d day                    |
| 23 | Moynihan<br>Med Chronicle,<br>Manchester 1902,<br>III, 367               | F  | 60 | Hizmatoma very vascular with fibroid capsule. Mass of tumor is composed of network of fibrin in different stages of organization |  | Symptoms of ovarian tumor                                                                                                                                                                                             | Tumor removed with its adherent gut                                                                                                                                                                                                            | Mesentery of small intestine                | 73 inches of small intestine | Death on 4th day from bronchitis   |
| 24 | Murphy, J B<br>Clinic Review 1901,<br>XIV, 103                           | F  | 26 | Fibroma                                                                                                                          |  |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                | Mesentery of ileum                          | 24 in                        | Recovery                           |
| 25 | Weir Robt F<br>Med Record<br>1900, LVII,<br>1137                         | M  | 40 | Sarcoma                                                                                                                          |  | Tumor in central portion of abdomen recognized about 2 months ago by patient. In digestion prior to that time Tumor movable but sensitive to touch                                                                    | Tumor lay in pelvis from which it was easily brought out, but a portion of small intestine to which it was attached broke and 'leaked' into the abdomen, but was promptly controlled. Tumor was removed with a large amount of small intestine | Mesentery and brim of pelvis                | 8 ft 2 in of small intestine | Death in 36 hours from peritonitis |

TABLE I.—SOLID TUMORS OF THE MESENTERY—*Continued*

| Case | Reporter                                                        | Sex | Age | Growth                                                                                                                                            | Previous History                                                                                                                        | Operation                                                                                                      | Attachment           | Resection                    | Post Operative History |
|------|-----------------------------------------------------------------|-----|-----|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------|------------------------------|------------------------|
| 26   | Grandin, E. H.<br>Am J Obst,<br>1902, XLVI,<br>225              | F   |     | "Hen's egg" shaped tumor, friable and contents of which somewhat resembled the decomposed yolk of an egg, Dermoid cyst (?) possibly a Cole steoma | Patient was referred by family physician for removal of abdominal tumor                                                                 | Tumor was not readily found but was finally located in mesentery of jejunum, and removed                       | Mesentery of jejunum | None                         | Nothing given          |
| 27   | Kengla, Louis<br>A Occidental<br>Med Times<br>1902, XVI,<br>140 | M   | 70  | Pure fibroma, weighing 4½ lbs                                                                                                                     | Enlargement of abdomen first noticed 3 years previously. No pain or discomfort, but obstipation, which led him to consult his physician | Tumor and involved bowel removed and anastomosis by Murphy's button. Bowel was peculiarly wrapped around tumor | Mesentery            | Involved intestine 8½ inches | Died on 3d day         |

In reviewing the literature of the past five years there are found twenty-eight cases of solid tumor of the mesentery (See Table I) Twenty-seven of these cases I have tabulated for reference The twenty-eighth case, that of Doleris' (*Gynecologic, Paris*, 1904, Vol iv, 108) could not be obtained and consequently I am not sure it belongs to this group, so have been obliged to pass it by in the following analysis An analysis of these cases shows the following

TABLE II —SOLID TUMORS OF THE MESENTERY

| Kinds of Tumor             | No of Cases | Recoveries | Deaths | Mortality (percentage) |
|----------------------------|-------------|------------|--------|------------------------|
| Fibromata                  | 9           | 8          | 1      | 11.1                   |
| Sarcomata                  | 7           | 1          | 6      | 85.7                   |
| Lipomata                   | 2           | 2          | 0      | 0.0                    |
| Myxofibromata              | 2           | 2          | 0      | 0.0                    |
| Carcinoma                  | 1           | 0          | 1      | 100.0                  |
| Lymphangioma               | 1           | 1          | 0      | 0.0                    |
| Tubercular                 | 1           | 0          | 1      | 100.0                  |
| Colesteoma (?)             | 1           | 1          | 0      | 0.0                    |
| Hæmatoma                   | 1           | 0          | 1      | 100.0                  |
| Myxoma                     | 1           | 0          | 1      | 100.0                  |
| Large Spindle-celled Tumor | 1           | 1          | 0      | 0.0                    |
| Totals                     | 27          | 16         | 11     | 40.7                   |

A further analysis of these cases shows that out of the twenty-seven operations there were 13 resections of gut, varying in length from 4/5 in in the shortest to 8 ft 2 in in the longest Of these 13 resections, six died and seven lived, or a mortality of 46.15% Three of these resections were for sarcoma, all of which died Five were for fibromata and one only died, which gives a mortality of 20% The number of males affected is 11, ranging in age from 14 to 70 years, against 16 females ranging in age from 8 to 60 years

In this series of cases the fibromata are most numerous, with the sarcomata a close second When we consider that Case 11 of series was most probably a sarcoma (since it formed metastases in liver and sigmoid flexure) we have 8 sarcomata against 9 fibromata With the carcinoma case we have 9 malignant cases out of 27, or 33 $\frac{1}{3}$ % of series

As to etiology we know nothing, our ignorance being quite as profound as about tumors springing from other sources. Trauma is said to be a cause and we all know how unreliable a history of trauma is, especially when leading questions are asked, still in Case 17 of series the sarcoma was either caused by, or more probably hastened in its course by the patient's falling from his horse and hurting himself badly. Cases are not uncommon in children. Arnstein reported a case at the age of 4 years, and collected nine others in children. The present series shows two in children of 8 and 14 years, while my own case could not have occurred later than 12 years when the patient noticed the growth herself. Most of the cases occurred between the ages of 30 and 45, with the extremes of age from our present knowledge between 4 and 70 years.

All of these tumors seem to have a special tendency to become malignant, sooner or later, even though they may remain benign for years. Most of them become rapidly malignant. This seems especially to be the case in very young patients if growth is rapid. The origin is generally between the folds of the mesentery, or else retroperitoneal, the growth pushing its way between the folds of the mesentery as it enlarges, and at the same time growing backward and becoming attached to the vertebral column. In my own case the origin was probably intermesenteric, with early pedunculation, for the tumor was evidently perfectly free in the abdominal cavity except for its small pedicle.

The diagnosis is never certain and generally it is not known till the abdomen is opened. It will usually be found impossible to differentiate between solid and cystic tumors unless you can get fluctuation, which is rare on account of the consistency of cyst contents. The diagnosis might be made by aspiration, but this is a procedure entirely unwarranted, because of the disturbance the needle produces, and the fact that the presence of a tumor demands operation whether it be cystic or solid. The most common growths with which these tumors may be confounded are ovarian cysts. This confusion can generally be obviated by examining the patient in the Trendelenberg position, when the intestines gravitating toward the diaphragm greatly facilitates diagnosis. The other conditions

with which confusion may be had are tumors of the pancreas and kidney, also extensive hydrops of the gall-bladder, in which condition the distended and freely movable organ may readily be confounded with mesenteric tumor, but its traceable connection with the liver usually makes the distinction clear. Carcinoma of the stomach or intestines and cysts of the spleen are also to be borne in mind. Floating kidney is especially to be remembered, and a diagnosis of this condition would be well-nigh impossible were it not that when a kidney is sufficiently movable to be confounded with a mesenteric tumor it can be caught up and its renal contour readily made out, and the palpating hand can be pressed into the bed-space where the organ should be normally. Cysts of the spleen cannot be differentiated from cystic tumors of the mesentery, and seldom from solid tumors, unless fluctuation can be determined.

In conclusion, the exact diagnosis is not of vital importance, but the *one important thing is to recognize the presence of a tumor early*, which fortunately is easily done. All tumors in the abdominal cavity demand immediate operation no difference what the growth may be, and the mortality will be lowered by a recognition of this fact and the early surgical treatment of the patient. We all, however, like to make an exact diagnosis, and we should never leave anything unturned in our endeavor to arrive at a correct conclusion, provided we do not jeopardize the life of our patient by so doing. We should always bear in mind the best procedure to insure the patient's safety and future health. After all, the best method to arrive at a correct diagnosis is to hold in mind all the conditions that we might have in any given region and confirm or eliminate them one by one till our conclusion is reached.

The only treatment is removal of the tumor just as soon as it is diagnosed.

REPORT OF CASE—In the latter part of September, 1904, Mrs. M., aged 26, married, was referred to me for operation. She gave the following history:

Family history negative. Measles at age of 8, no other sickness, and was a strong, healthy girl. Patient says at the age of 12 she noticed a movable "swelling" a little larger than a walnut

in her abdomen just to the right of the navel. It gave her no pain and she thought nothing of it. A year later she began to menstruate and her mother noticed the tumor which was then a little larger. Menstruation was normally established and continued regular every four weeks, lasting three days. She was married in November, 1897, at 18 years of age. Her husband says that he noticed the tumor at that time and it was about the size of a "big apple." Soon she became pregnant and on October 3, 1898, after a normal pregnancy and labor her first child was born. After weaning the baby menstruation was again normal and regular till her second pregnancy, in 1901. On March 13, 1902, the second healthy baby was born after normal pregnancy and labor. This baby, as the first, was nursed by its mother.

During all this time the tumor had grown slowly, but a little more rapidly since the birth of the first child, so that two years after the birth of the second child the tumor was about the size of a cocoanut, freely movable, giving no pain or other inconvenience save from its weight. The growth was not rapid till three months before I saw the patient. During the two months prior to my seeing the case the growth had been very rapid, attended by gradually increasing pain and discomfort, being so severe as to confine the patient to her bed for the month previous to my seeing her. She came into the hospital on a cot on which she was removed from her home in Southern Kentucky.

Examination showed an anemic, cachectic, much emaciated patient, with a nodular tumor occupying all the abdominal cavity from just below the ensiform cartilage to the pubes. Palpation showed a fixed mass of very irregular morphology, with a large, hard, rounded nodule in the umbilical region, the rest of the nodules and depressions feeling rather soft and spongy, but no fluctuation. Vaginal examination showed the uterus to be fixed and continuous with the rest of the tumor as far as I could tell, but it presented the peculiarity of the whole pelvis being full of tumor without any definite form. Heart and lungs seemed good. No constipation but severe digestive disturbance. No vomiting. Pulse 120, temperature 102½.

No diagnosis could be made, but I thought it was probably a multilocular adeno-cystoma of ovary with twisted pedicle, with subsequent inflammatory exudate and consequent adhesions.

The condition of the patient was so bad that I did not deem it advisable to attempt operation at once, thinking that probably the condition was largely due to her long, exhausting train trip, and that a few days' rest would improve her condition. During the next two days she improved very slightly. I then left the city and was gone for five days. I returned October 1st only to find the patient *in extremis*. The tumor appreciably enlarged during absence. Temperature 103, pulse 130, with absolute suppression of the urine, which had existed for the past 66 hours. She had been catheterized repeatedly and not a drop of urine. The patient was put in hot packs, given diuretics, etc., without avail. There were absolutely no symptoms of uremia, so I decided to open the abdomen.

The abdomen was opened 72 hours after the complete suppression had occurred, or about six hours after I returned to the city. As soon as the peritoneum, which was injected and inflamed, was opened, brown mucoid, sanguineous fluid began to pour out. A large, round, solid tumor, appeared at the upper angle of the incision, and from this solid tumor above, conforming to the contour of the abdomen, extending into the pelvis and involving the peritoneum, was the rest of the tumor, which was soft, mushy and slimy to feel, bled at every touch, and exceedingly friable without capsule or other covering, and of a raw, dark red color. This friable portion of the tumor was attached to the solid tumor on either side and below, but not above. The solid tumor was easily separated from the soft portion and its pedicle easily tied off and the tumor cut away. The new growth was then thoroughly explored and found to involve everything, entering the peritoneum at all places just as if it were no barrier to its progress. The parietal, intestinal, uterine and tubal peritoneum were all encased in the growth, which filled the entire lower cavity. This new growth was torn away in handfuls to the extent of a wash basin full. The growth resembled a partially organized blood-clot mixed with slimy mucus, more than anything I can think of. Not more than half of this new growth was removed, because the hemorrhage was so profuse and the futility of getting it all away so apparent. What was removed was done so chiefly out of curiosity and hoping to relieve the pressure from over the ureters to see the



effect on the kidneys, believing from the symptoms that I had a pressure anuria to deal with. The cavity was then packed with gauze to control hemorrhage and the ends of the compression packs brought out of the lower angle of the wound, and the abdomen closed. The patient was almost dead from hemorrhage and shock at the stopping of the operation.

Saline was given under the breasts all during the operation and after the patient was put to bed she rallied under strong stimulants and lived for five days.

One of the most interesting features of the case is the fact that in the first twenty-four hours after operation she secreted 12 ounces of urine, 23 ounces the next, and 25 the following day. It was not measured after that, but there was no further suppression till death.

The patient was so much better on the second day that I hoped for sufficient recovery for her to get about again. My hopes were dispelled on the third day by finding my dressings still saturated with the same bloody, slimy fluid that ran from the abdomen on the day of operation. This flow continued without any abatement at all till the patient died of exhaustion five days after operation.

Post-mortem was refused. The solid tumor was round, fifteen cm in diameter, and weighed 3.7 kg (about 8¼ lbs). It had a peritoneal covering except about one-third of the lower side, which was deperitonized by the new growth. The pedicle, which was about two inches wide and one inch thick, was almost identical in structure with the new growth and was apparently the channel of the new growth reaching the cavity.

On splitting the solid tumor open it was found to be fibroid with necrotic degeneration in its center, surrounded by a glistening, grayish white tissue zone which extended into the pedicle and replaced the fibrous tissue of the lower part of the tumor and that part which lay towards the symphysis. Microscopic sections showed the tumor in the non-degenerated portion to be fibroid with small pale nuclei showing poor nutrition. The degenerated new growth, on the other hand, showed masses of vigorous round cells having large clear nuclei with numerous mitotic figures, indicative of rapid growth and characteristic of round-celled sarcoma. The new growth seemed to have sprung

from the pedicle and presented the same microscopic picture as the sarcomatous portion of the original tumor, the cells however, had a decidedly more embryonic look than the former

This tumor was the most malignant growth I ever saw and the sarcomatous degeneration must have occurred during the last few months, and before that time was a benign growth that could have been easily removed and the patient's life saved

The lesson is the old story, but forcibly retold Had the patient not carried this tumor for years, but submitted to operation sooner, both the pathology and termination of this case would have been changed

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The above are among the more important articles No attempt at a complete bibliography has been made References to cases reported are given in Table I

## CHYLOUS CYSTS OF THE MESENTERY.

BY MILES F PORTER, M D ,

OF FORT WAYNE, INDIANA,

Professor of Surgery and Clinical Surgery in The Indiana Medical College , Department of Medicine, Purdue University

THE basis of this paper consists of a study of the literature on the subject, including the reports of nineteen cases which I have been able to collect, together with one case which occurred in my own practice, of which the following is the report

J W , age 22, male Referred by Dr A H Mouser, of Latty, Ohio Patient's father was killed by lightning, mother living and well Both maternal grandparents died of pulmonary tuberculosis Commencing when he was ten years of age, the patient had numerous attacks of pain in the right lower quadrant of the abdomen Two years prior to my visit he had a severe attack, which lasted for three months After that attack he remained well for some months, when he had a milder attack, which lasted a week This last attack was in July, 1904 In February, 1905, the pain came again and continued intermittently until May 3 of the same year, when I saw him with typical symptoms of obstruction of the bowel There was a tumor in the right ilac region Tenderness was not marked and was rather diffuse The abdomen was markedly tympanitic, and there was no localised muscular rigidity A diagnosis of appendicitis had been made by Dr Mouser, in which I concurred On opening the abdomen through the right rectus a group of chylous cysts was found, together with a volvulus involving that portion of the ileum attached to the mesentery in which the cysts were found The number of cysts of itself precluded treatment by drainage, their enucleation could not be accomplished without serious danger to the integrity of the gut, besides the vitality of the gut had already been nearly, if not quite, exhausted by the twist Hence excision of the bowel, together with the mesentery containing the cysts, was done and an end-to-end anastomosis made with the aid of a Murphy button The abdomen was closed without drainage

The patient did well until the night of the sixth day, when he commenced to complain of abdominal pain, and died within twelve hours

A post-mortem examination showed leakage at the mesenteric attachment at the point of anastomosis. The union was perfect throughout the rest of the circumference of the gut. No signs of peritonitis. The button was loose in the gut save for a minute shred of tissue which still held. Figures 1 and 2 are drawings made from the specimen

*Literature*—The literature on the subject so far as the text-books are concerned is very meager. Sutton<sup>1</sup> devotes ten lines to the subject of chyle cysts and Douglas<sup>2</sup> the same space. Greig Smith<sup>3</sup> devotes less than four pages to the entire subject of mesenteric cysts, including their treatment, while Maylard<sup>4</sup> does not mention the subject. In Treves's "System of Surgery" and in the "International Text-Book of Surgery" will be found the best text-book articles I know of on the subject, but both are very short and imperfect. The current literature contains comparatively few articles upon chylous cysts. Among those which I have found I will mention Bramann's,<sup>5</sup> Fetherston's<sup>6</sup> report of a case with the discussion thereon, Mendes de Leon's<sup>7</sup> and Rasch's<sup>8</sup> with the discussion. Moynihan in his excellent paper<sup>9</sup> on "Mesenteric Cysts" devotes three and a-half pages to chylous cysts. Dowd<sup>10</sup> in his paper bearing the same title gives less than two pages to chylous cysts. Carson<sup>11</sup> of St. Louis read a paper upon "Chylous Cysts of the Mesentery" before the American Medical Association in 1889. Unjenim and Petroff<sup>12</sup> wrote an excellent paper on the subject and collected all the cases they could find in the international literature.

*History*—The history of the development of this subject was until recently inextricably bound with the history of mesenteric cysts in general, and even now this is true in a great degree, though in later years, as our knowledge has grown, a separate study of chylous cysts has been made by a few writers. Cysts of the mesentery were first classified by Portal in 1803. Dowd<sup>10</sup> in his article gives reference to 145 cases of cyst of the mesentery of the various kinds. Unjenim

and Petroff<sup>12</sup> in 1889 reported the first case of chylous cyst in Russian literature and collected nine other cases from international literature. When Bramann's case was operated (1886) no other case was recorded which had been treated surgically. Kilian<sup>13</sup> reported in 1886 a "lymph-cyst" treated surgically, this was two months later than the Bramann case was operated, but before its publication. Carson's case was the first one reported in America, so far as I know, and the largest that had been reported at that time in any country. Rasch was of the opinion that his was the first case of chylous cyst, occurring in a woman, published, but in this he is mistaken, for Kuester and Werth each operated upon a woman in 1882, while the Russian case above referred to antedated that of Rasch a year and Pitman's case was reported<sup>14</sup> in 1857.

*Frequency*—Chylous cysts of the mesentery belong to the surgical rarities. When Carson wrote his paper he was able to collect eleven cases, and the writer has been able to find but nine more, including his own, making in all twenty cases. One of these (Eppinger's) is perhaps doubtful, as he reported it as a dermoid cyst, but Werth considered it a chylous cyst.

Concerning the relative frequency of serous and chylous cysts there is considerable difference of opinion among writers. Hahn<sup>15</sup> says that serous cysts are the more common, while Smith<sup>16</sup> and Dowd<sup>10</sup> say that chylous cysts are the more common. In my own research in current literature I have found twenty-nine cases of serous cysts and twenty cases of chylous cyst and am, therefore, forced to side with those who think the serous cysts more common.

*Pathology and Etiology*—Dowd<sup>10</sup> in speaking of the origin of chylous cysts says "Taking these cysts together it seems pretty well established that the chylous cysts are pre-formed cysts, situated in such close relation to the lacteals that chyle has been effused into them and that they are really of embryonic origin, in structure similar to ovarian and par-ovarian cysts."

The microscopic examination of the specimen removed from Rasch's patient seemed to show in this case that the tumor originated from the rupture of a chyle vessel probably produced by trauma, and in the discussion of this paper Doran



FIG 1—Author's case Showing bowel with mesentery and cysts excised Multiple

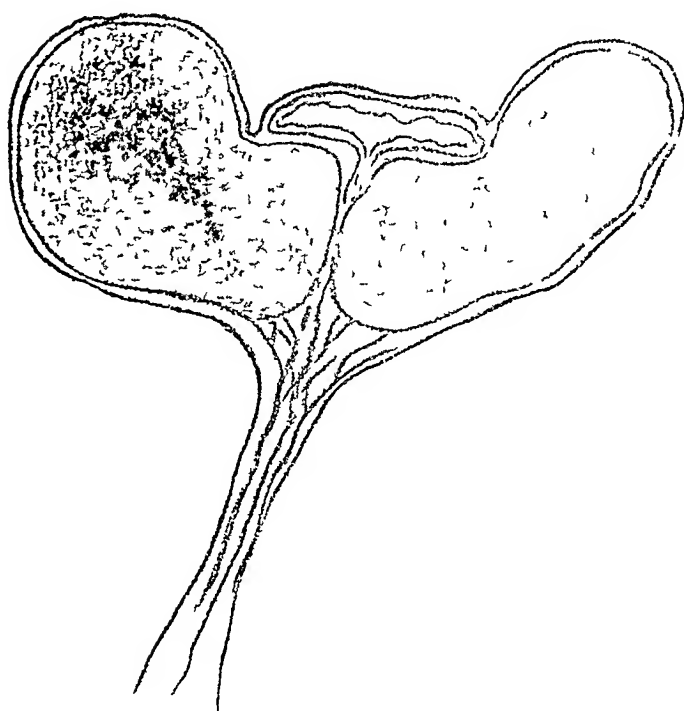


FIG 2—Drawn from transverse section through specimen from author's case Showing flattening and compression of bowel by cyst

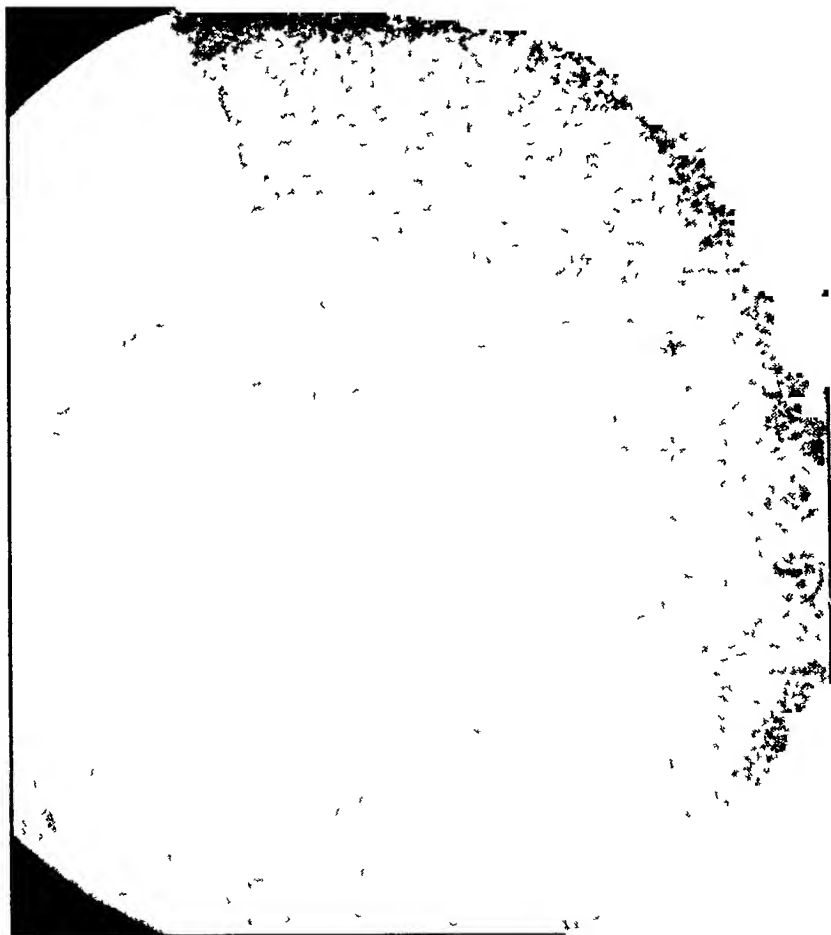


FIG 3

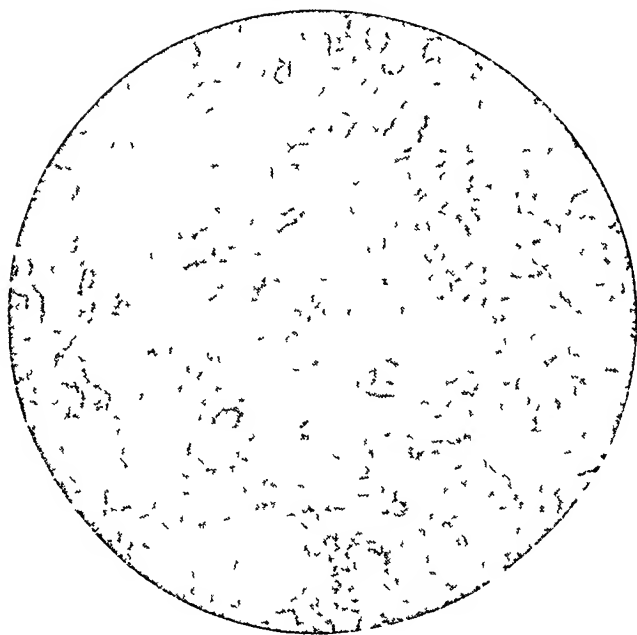


FIG 4

agreed entirely with this view. Upon similar evidence it was determined that Fetherston's case<sup>6</sup> originated in a lymph gland. The specimen from Bramann's case<sup>5</sup> presented no endothelium nor epithelium on the inner surface of the cyst wall and originated most probably, as did Rasch's, from the rupture of a lymph vessel. According to Carson<sup>11</sup> eight of the cases collected by him were due to degeneration of lymph glands and three to dilatation of lymphatics. Von Blum suggests as a common origin typhoid or tubercular degeneration of mesenteric glands.

That a few cases of chylous cysts have been reported which had their origin in the dilatation of the receptaculum chyli or large retro-peritoneal lymphatics there can be no doubt, but cysts having this origin are not likely to occupy the mesentery but are usually in close contact with the spine, as in the case reported by Scharlemmer<sup>17</sup>. In my own case there were several distinct and relatively widely-separated cysts. Chemical and microscopical examination of the contents of the cysts proved it to be chyle. The report of the microscopical examination of the specimen, made by D. J. B. McEvoy is as follows:

The gross specimen submitted for examination consisted of a portion of intestine about four and one-half inches long with attached mesentery. In the mesentery there were several cysts from which the fluid had been evacuated.

The specimen illustrated in photograph number 3, was taken from the wall of a large cyst next to the bowel. A cube was removed from the floor of this cyst next to the intestine and included a portion of the bowel wall which was continuous with the base of the cyst. Microscopical examination of this cube shows a great increase in the lymphatic tissue of the bowel wall. The bowel mucosa still shows the outline of the secreting glands, which are normal to the part, but the epithelial lining has been destroyed and the lumen filled with lymph-cells. These lymph-cells also, distend the periglandular structure. In some places we find a layer of lymph-cells covering the mucosa. Beneath the mucosa, infiltrating the muscular layer of the bowel and extending upwards to form the floor of the cyst, was a mass of lymphatic tissue consisting of cells in all stages of amoeboid movement.

Photograph number 4 was taken from a section of an enlarged mesenteric gland in the vicinity of the cyst.

Microscopical examination shows capsule to be intact. The structure does not differ from the normal gland except we find a general hyperplasia of all the elements.



The photograph shows the lymph spaces of the periphery and compact masses of lymph tissue below

These micro-photographs were made with the low power to include a wide field

Undoubtedly, then, we are warranted in coinciding with Moynihan<sup>9</sup> in the opinion that the origin of chylous cysts is manifold, and disagreeing with Dowd<sup>10</sup> when he says that they are all embryonic in origin. It naturally follows that there can be nothing constantly distinctive in the pathology of chylous cysts of the mesentery except their contents and their location between the folds of the mesentery. Microscopically glandular endothelium will be found in cysts originating in degeneration of lymph-glands and endothelium in those originating from dilatation of lymph vessels, provided, however, atrophy of these elements has not resulted from pressure. Naturally those cysts arising from rupture of lymph-vessels will not present endothelium on the inner surface of their walls.

These cysts may be unilocular or multilocular, single or multiple. Multilocular chylous cysts may undoubtedly become unilocular by pressure-absorption, just as obtains in ovarian cysts. It is also possible for multiple cysts to become by this same process first multilocular and single and finally single and unilocular.

In appearance these cysts are usually creamy white and have large vessels traversing their walls. Accidents such as volvulus, hæmorrhage into the cyst or cyst-wall and peritonitis may change their color and render the vessels indistinct. Usually these cysts have no distinct pedicle, but they may have. The relation of the bowel to the cyst varies much. The accompanying illustrations (Figs 5, 6, 7, and 8) show some of the varying conditions that have been noted along these latter lines.

*Diagnosis*—An exact diagnosis is practically impossible, neither is it necessary. It goes without saying that one cannot have any idea of the character of the cyst contents until he sees it, unless tapping is resorted to, and this proceeding is to be condemned.

Developing in the mesentery of the small intestine, as the large majority of these tumors do, their location and

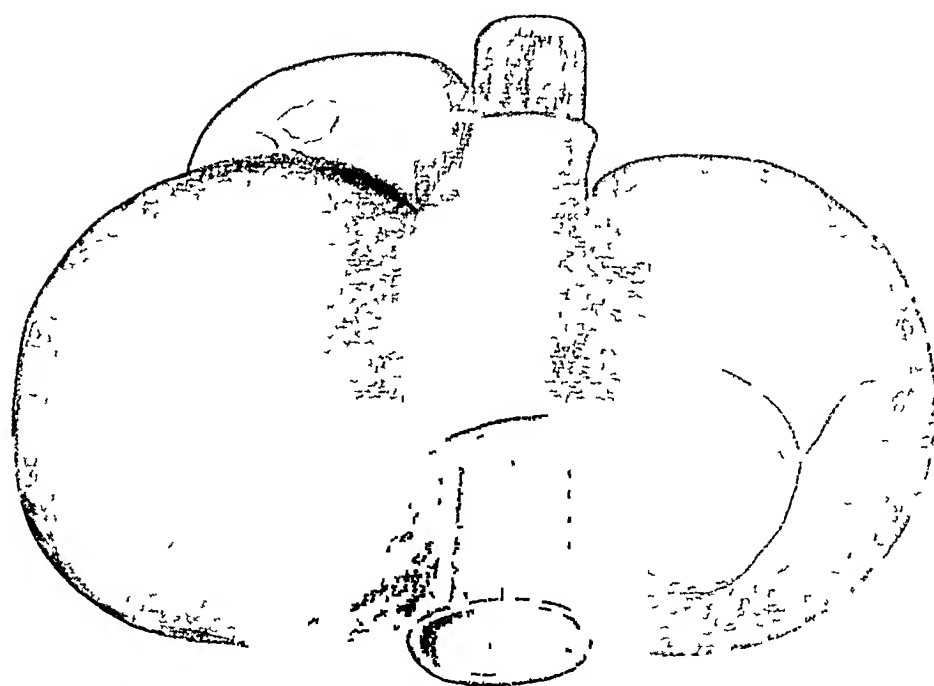


FIG 5—From Moynihan Annals of Surgery Vol XXIV Tube passes through gut

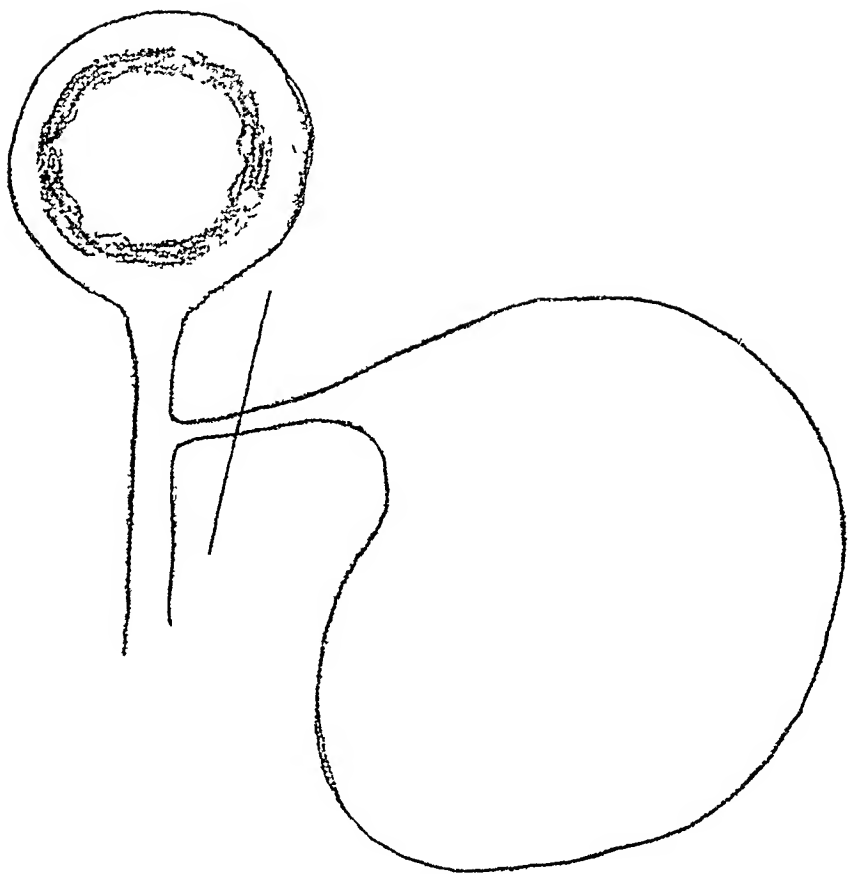


FIG. 6.—From Moynihan Showing cyst with pedicle. Gut was strangulated from traction on pedicle. Unilocular.

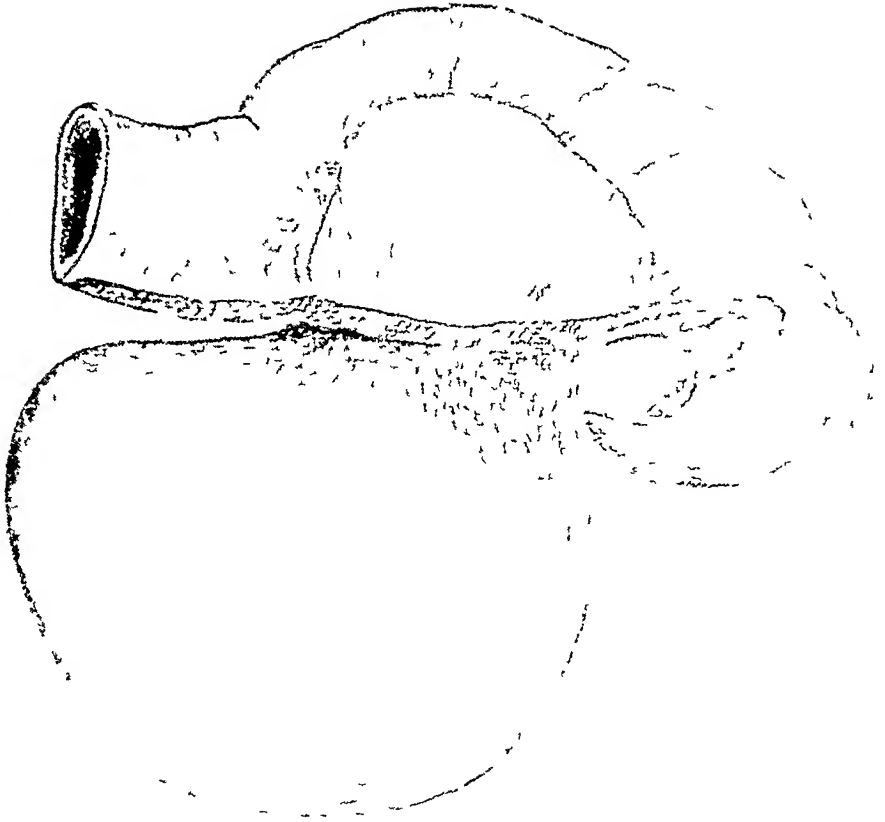


FIG 7—From Moyumhan, Multilocular cyst

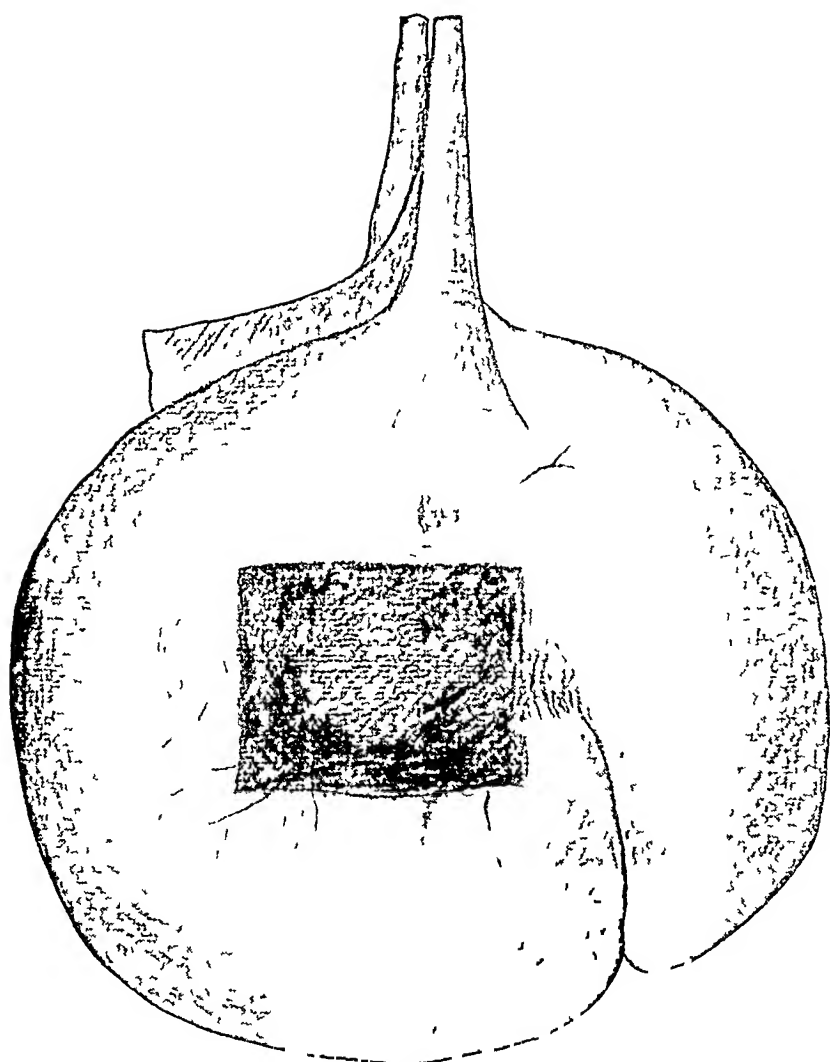


FIG 8—Robson's case From Moxnham Small pedunculated cyst

attachment, when the latter is determinable, is somewhat distinctive. A centrally located, movable, fluctuating tumor would raise a strong suspicion of mesenteric cyst, and if the tumor were crossed by a portion of intestine the suspicion would become a conviction. Cysts of the mesentery more often cause abdominal pain than do any cystic abdominal tumors. Hence the diagnostic significance of pain in these cases. The same thing may be said of vomiting, also. Especially significant are these symptoms if unaccompanied by signs of infection or other complications. Von Blum<sup>18</sup> was the first to call attention to the diagnostic significance of recurring attacks of volvulus in mesenteric cyst. The patient whose case he reported had had five or six attacks prior to time of operation. This was true of my own case and also of several others of which I have read the reports.

Recurrent attacks of belly pain, accompanied by symptoms of bowel obstruction in a case presenting a centrally attached abdominal tumor, would strongly suggest mesenteric cyst.

Chronic increasing obstinate constipation is not infrequently present in these cases and is due to the stretching and flattening of the bowel as it crosses the cyst.

The age of the patient is of little or no diagnostic importance. A number of cases under ten years are reported, but the average age in fifteen cases was found to be over thirty-four years.

The frequency with which the history of trauma is given by these patients would seem to show that this might be of some aid in differential diagnosis. In some cases, as in my own, for instance, where there were a number of relatively widely separated small cysts which produced no appreciable tumor until volvulus resulted, even an approximately correct diagnosis will not be possible before the abdomen is opened.

With care, however, the diagnosis of mesenteric cysts may be made in the majority of cases, though the character of the cyst contents cannot be determined until the abdomen is opened.

*Treatment* — That mesenteric cysts of all kinds seriously endanger life there can be no question, hence there can be no

question but that their removal as soon as the diagnosis is made is the only proper line of treatment to follow. As to exactly what method should be adopted in their removal there is great difference of opinion, but it appears evident that this difference arises from the fact that conclusions have been reached from too narrow premises. Those cysts which have a well-defined pedicle are best removed after ligating the pedicle, as in ovarian cysts. Others may be easily and safely enucleated, others will be best treated by stitching the open sac to the parietal peritoneum and draining.

The fear entertained by some, and very naturally, that there might be danger of a permanent chylous fistula in cases treated by drainage has proven unfounded.

There are other cases in which resection of the bowel, together with that portion of the mesentery containing the cyst or cysts, will be required. Such a procedure seemed best in my case. Drainage was out of the question because of the number of the cysts, while either enucleation or excision would certainly have led to gangrene of the bowel.

### CONCLUSIONS

- 1 Chylous cysts of the mesentery are to be classed with the surgical rarities, being less common even than serous mesenteric cysts.

- 2 Many chylous cysts of the mesentery begin as multiple cysts, later become multilocular and finally unilocular by the process of pressure-absorption.

- 3 The origin of chylous cysts is manifold and the microscopic pathology varies equally.

- 4 Trauma seems to be a causative factor in quite a number of chylous cysts.

- 5 Diagnosis of cyst of the mesentery may be impossible, but in the majority of cases can be made before opening the abdomen, but the character of the cyst contents cannot be determined by any safe procedure until the belly is opened.

- 6 The treatment of chylous cysts of the mesentery consists in their removal by that technic which seems best adapted to the case in hand after it has been studied through the open abdomen.

TABLE OF CASES

| No | Reporter             | Where Reported                                                                                        | Age | Sex | Origin                                              | Operation                                     | Result | Remarks                                                            |
|----|----------------------|-------------------------------------------------------------------------------------------------------|-----|-----|-----------------------------------------------------|-----------------------------------------------|--------|--------------------------------------------------------------------|
| 1  | Bramann              | Langenbeck's Archiv,<br>Vol 35                                                                        | 63  | M   | Receptaculum chyli<br>Between folds of<br>mesentery | Incision walls sutured<br>to skin and drained | R      | Tumor was size of child's head                                     |
| 2  | Kilian               | Berlin K Woch,<br>Nov 25, 1888                                                                        | 61  | F   | Thoracic duct                                       | Incision and drained                          | R      | Had been tapped twice and refilled<br>(4700 cc chyle withdrawn)    |
| 3  | Kuester              | Ein Chr Erkentniss,<br>Berlin, 1882                                                                   | 21  | F   | Between folds of mes-<br>entery                     | Extirpation                                   | D      | Death due to peritonitis from wounding<br>bowel Size of adult head |
| 4  | W                    | Millard and Tilghart's<br>paper, Berlin K Woch,<br>1887 No 23                                         | 31  | M   | Degenerated mesen-<br>teric gland                   | Extirpation                                   | R      | Kidney size                                                        |
| 5  | Werth                | Archiv f Gynecol, 1882<br>Vol 19                                                                      | ?   | ?   | Mesenteric gland                                    | Extirpation                                   | R      | Size of child's head                                               |
| 6  | Wyenn and<br>Petroff | Dhevnik Kazans Kaho<br>Obsch Watchus, Nos<br>7 and 8, 1888 also<br>London Med Record,<br>Aug 20, 1888 | 26  | F   | Mesenteric glands                                   | Extirpation                                   | R      | Case was Wyenn and Petroff's, operated<br>by Fenominoff            |
| 7  | Carson               | Jour A M A,<br>May 10, 1890                                                                           | 42  | M   | Not known                                           | Incision and drainage                         | R      | Large as adult head Wall very thick<br>and hard                    |
| 8  | Moynihan             | ANNALS OF SURGERY,<br>July, 1897                                                                      | 18  | F   | Mesentery of ileum                                  | Enucleation                                   | R      | Operated in second attack of pain, ten-<br>derness and vomiting    |
| 9  | Moynihan             | ANNALS OF SURGERY,<br>July 1897                                                                       | 7   | M   | Mesentery of ileum                                  | Pedicle ligated and<br>cyst removed           | D      | Pain, tenderness and vomiting were<br>symptoms                     |
| 10 | Syme                 | ANNALS OF SURGERY,<br>Vol 23, p 605                                                                   | 19  | M   | Mesentery of ileum                                  | Cyst enucleated, mesen-<br>tery closed        | R      | Contained 14 ounces of chyle                                       |



TABLE OF CASES—Continued

| No | Reporter      | Where Reported                                 | Age       | Sex       | Origin                                       | Operation                                                   | Result | Remarks                                                                                                                                                       |
|----|---------------|------------------------------------------------|-----------|-----------|----------------------------------------------|-------------------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Eppinger      | By Carlson in Jour A M A, May 10, 1890         | Not given | Not given | Not given                                    | Found post mortem                                           |        | Reported as dermoid, but regarded as chylous by Werth                                                                                                         |
| 12 | Rosch         | Trans London, Obs Soc, 1889                    | 27        | 1         | Mesentery of small bowel                     | Cyst stitched to abdominal wall and drained                 | R      | Six pints of chyle Pain in belly led to discovery of tumor                                                                                                    |
| 13 | Mendes de Leo | Amer Jour Obs, Vol 24, 1881                    | 27        | F         | Not given                                    | Cyst opened stitched to abdomen drainage                    | R      | Tumor very movable and caused severe pain                                                                                                                     |
| 14 | 1'etherston   | Australian Med Journal, 1890 New Series, No 12 | 33        | 1         | Mesentery of ileum                           | Well - formed pedicle, transfixed and tied                  | R      | Three pints chyle Had had several severe attacks of belly pain Glass drainage in abdomen                                                                      |
| 15 | Porter        | Present paper                                  | 22        | M         | Mesentery of ileum, degenerated lymph glands | Excision of cysts with bowel anastomosis with Murphy button | D      | Died from small leakage of mesenteric attachment which occurred on seventh day Numerous attacks of belly pain                                                 |
| 16 | Roktausky     | Lehrbuch der Pathol                            | 53        | M         | Mesenteric gland                             | Found post mortem                                           |        | Walls of cyst thick and flabby Contents inspissated chyle, cinnamon brown in color                                                                            |
| 17 | Enzmann       | Basle Quang Dis                                | 77        | 1         | Thoracic duct                                | Patient died of endocarditis                                |        |                                                                                                                                                               |
| 18 | Roktausky     | Lehrbuch der Pathol                            | 36        | M         | Mesenteric gland                             | Found post mortem                                           |        | Several small cysts with thick walls and white contents, and one size of child's head, lobulated and containing rosy fluid with glutinous red and black lumps |
| 19 | Virchow       | Berlin K Woch, Nov 14, 1887                    | Not given | Not given | Not given                                    | Post mortem                                                 |        | Multilocular                                                                                                                                                  |
| 20 | Pitman        | Brit Med Jour, May 16, 1887                    | 23        | M         | Mesentery of small bowel                     | Post mortem                                                 |        | Patient died of peritonitis due to bowel obstruction                                                                                                          |

## SUMMARY OF TABLE

Whole number of cases reported, 20

Number operated upon, 14

Total deaths in operated cases, 3

Number of cases treated by excision or enucleation of cyst, 8, of which 6 recovered and 2 died

Number of cases treated by incision, stitching sac to abdomen and draining, 5, all of which recovered

One case treated by excision of cyst, mesentery, and bowel, died

Only 6 cases were found reported post mortem, which would seem to prove that when present chylous cysts of the mesentery usually manifest themselves by symptoms sufficiently pronounced to lead the host to consult a physician

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- <sup>6</sup> Australian Med Jour 1890
- <sup>7</sup> Amer Jour Obstetrics, vol 24, 1891
- <sup>8</sup> Trans Obstet Soc of London, vol 31, 1889
- <sup>9</sup> ANNALS OF SURGERY, vol 24, p 1
- <sup>10</sup> ANNALS OF SURGERY, vol 32, p 515
- <sup>11</sup> Jour A M A, May 10, 1890
- <sup>12</sup> Dhevink obsh vrach g Kazans, Nov 7 and 8, 1889, and London Med Record, Aug 20, 1889
- <sup>13</sup> Berlin Klin Woch S 407, ff
- <sup>14</sup> Brit Med Jour, May 16, 1857
- <sup>15</sup> Medical Record, Sept 24, 1887
- <sup>16</sup> Abdominal Surgery, Vol 2, p 1065
- <sup>17</sup> American Medicine, vol 6, p 103
- <sup>18</sup> Jour of the A M A, Jan 11, 1902, p 139

## PERFORATING DUODENAL ULCER

BY J M ELDER, M D,

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J S, aged 38, came to the Montreal General Hospital at 6 P M, November 15, 1905, stating that while driving his express wagon that afternoon he had been seized with severe pains in the epigastrium. Associated with this pain, which came on quite suddenly there was violent retching and vomiting. He does not know the character of the material vomited, and says he was quite "out of his mind" on account of the agony he was in. There had been no previous history of illness, except an attack of abdominal pain eight years ago, which confined him to bed for a few days and kept him from work for about a month. He is not very clear about the details of this illness, but does not think he had any vomiting at that time. No illness since except indisposition following a "spree" or from a temporary bronchitis. Has used tobacco a great deal since youth, and up to three months ago had been a pretty heavy drinker, but for the past three months has abstained entirely from alcoholic beverages. He is a married man, with a healthy family, and his clinical history is good.

*Condition on Admission*—Tall, well built, strong man, complains of constant lancinating pain in the abdomen, with maximum intensity over the ensiform cartilage. He has vomited several times since admission, always accompanied by very severe retching, and the last two or three times vomitus has been well tinged with bright blood. There is no marked shock, temperature 99°, pulse 72, respiration 24. There is no evidence of any mental disturbance, and reflexes are normal. There is a very slight pallor, extremities somewhat cold, no œdema. No evidence of any hernia. Heart and lungs negative, chest emphysematous. He complains constantly of very severe pain. The abdominal wall is well retracted, and the muscles stand out on

both sides symmetrically. There is most marked rigidity throughout the abdominal area, a little more pronounced, perhaps, in the epigastrium. No mass can be felt. Palpation elicits generalized pain only, nothing local, on percussion the note is fairly tympanitic throughout, the right flank being somewhat less resonant than any other portion. The liver dulness is about normal, although the lower margin cannot be palpated. On account of the extreme agony of the patient it is rather difficult to conduct a satisfactory examination, but there appears to be a dull area in the hypogastrium, which it was thought might be due to a distended bladder, but which did not disappear upon passing the catheter. A hypodermic of morphia,  $\frac{1}{4}$  gr., was given, heat applied to the extremities, and the case watched carefully for a time.

When the patient was seen again, about nine o'clock that evening, the temperature had gone up to  $100\frac{2}{3}^{\circ}$ , pulse 96, and there was distinctly more rounding up of the abdomen, with an increase in the dull area in both flanks. The board-like rigidity of the abdominal muscles still persisted. Vomiting, too, was still present and in the vomited mucus there was a little fresh blood. A diagnosis was made of perforated gastric ulcer, notwithstanding the fact that there had been no previous history of digestive disturbance. Operation was decided upon and carried out at once.

After the usual preparation, and under ether anæsthesia, a median incision was made extending down from the ensiform cartilage towards the umbilicus, and upon opening the abdominal cavity free gas escaped. It was then found that the pyloric end of the stomach and the first part of the duodenum were adherent to the under surface of the overhanging liver. There was very little inflammatory reaction present, but upon separating these two adherent organs, a round perforation was found in the duodenum about three-fourths of an inch from the pyloric valve. It was situated in the anterior wall of the duodenum and was of sufficient size to admit an ordinary lead pencil. It was clean, punched-out with apparently very little undermining or erosion of the neighboring mucosa inside. The duodenum was brought out through the incision and the ulcer closed by simple suture, without excising its borders. The closure of the ulcer did not encroach upon the

lumen of the gut sufficiently to indicate a pyloroplasty. A reinforcing row of Lembert sutures were then introduced, and, for the sake of further security, a portion of the gastrohepatic omentum was sutured down over the site of the perforation. Looking down towards the lesser sac there appeared to be very little pus or other inflammatory material, and it was very easily wiped out and the parts returned to their normal position.

The next step in the operation was to make a counter opening in the abdominal cavity below the umbilicus in the median line, and here we came upon a very different state of affairs. The great omentum, coils of intestine, and the peritoneum generally, were very much reddened and injected, and large quantities of sour-smelling, seropurulent material were found filling all the spaces below, and especially had it gravitated down into the pelvis and also into the flanks. A large drainage-tube was introduced here, and a stream of warm ( $105^{\circ}$ ) normal salt solution introduced through the upper wound and allowed to flow freely out here. With this drainage-tube passed well down into the pelvis, giving free egress to the flow of water coming in through the upper opening, the abdominal cavity was thoroughly irrigated. Many particles of food which had been taken at the midday meal, notably some pieces of corn, pieces of potato, etc., could be identified as they came out of this lower wound. After irrigating till the water returned perfectly clear, a large drainage-tube was inserted down into the pelvis, the upper wound was closed in the usual way, without drainage, and the lower one down as far as the drainage-tube. The abdomen was left as full as possible of the normal saline solution, and the patient returned to bed, the head of which was raised about  $1\frac{1}{2}$  feet, so that the abdominal contents might gravitate towards the drainage-tube which was left in the pelvis ("Postural Drainage"). The contents of this tube were aspirated out every hour for the next 24 hours. The patient recovered very well from the shock of the operation and was fed entirely by rectum for four days. The post-operative temperature never at any time exceeded  $101^{\circ}$ , and became normal on the third day after operation and remained so until the recovery of the patient.

The convalescence was rapid and quite uneventful in every way. The drainage-tube was removed on the fourth day as the

discharge had ceased, and moreover the cultures from the peritoneal cavity, taken at the time of operation, were returned by the bacteriologist with a diagnosis of "no growth" Patient left the hospital on October 5, and since then has been in normal health and is now following his usual vocation of express driver He is able to eat anything that he wishes, although cautioned against excesses in any form

Some interesting points in this case are (1) The fact that a perforating duodenal ulcer was present without any previous symptoms in a man apparently strong and healthy (2) That with a perforating duodenal ulcer one may get bright red blood in the vomited material and thus point to a diagnosis, as in this case, of perforating gastric ulcer The absence of previous gastric symptoms may be explained by the fact that this was a duodenal ulcer and not a gastric one, although, contra, it is a well-known fact that duodenal ulcers do give gastric symptoms One is here reminded of the remark attributed to one of the Mayos, that, "in operating upon gastric ulcer it is always well to make the incision *to the right of the median line*, as the majority of gastric ulcers are duodenal" Mr Caird, of Edinburgh, in his address before the Canadian Medical Association at its Halifax meeting last summer, pointed out the frequency with which gastric ulcer affected the pyloric region, as distinguished from all other parts of the stomach, and one can easily fancy that whatever the etiological condition was that might produce a gastric ulcer on one side of the valve, the same condition might very easily produce it a few centimeters on the other side So that it is hard to draw a hard and fast line between gastric and duodenal ulcer, in fact, often clinically impossible

As regards the operation itself, it was a good illustration of the necessity of following a surgical rule in any given operation The well-known rule in operating upon gastric perforation, where there has been possible escape of stomach contents, is that the operator should always make a counter opening *below the umbilicus* in order to determine the condition of the general abdominal cavity Had we failed to do so in this case we would most assuredly have lost this patient by

subsequent general peritonitis The condition of the peritoneum at the site of the perforation appeared to be so good that one could have scarcely believed that the state of affairs further down in the abdominal cavity should have been so shocking as we found it to be when we made the second opening This case is, further, an illustration of the good result that follows early operation, a point which Mr Caird's series of cases so well proved The delay in operating upon this case was not to give time for shock to pass off, there being little shock present, but was entirely due to the fact that the patient at first absolutely refused operation, and only consented upon the solicitation of his relatives and his spiritual adviser, all of whom had to be summoned to the hospital I am quite convinced that had we delayed operation until the morning, a fatal general peritonitis would have supervened

# PRACTICAL POINTS IN THE SURGERY OF THE LARGE BOWEL, EXCLUSIVE OF THE RECTUM.<sup>1</sup>

WITH ILLUSTRATIVE CASES

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No effort will be made to determine the ultimate fate of the class of cases dealt with in this paper, its object being to indicate what the author has found clinically the best practice when an operation has, for adequate reasons, been decided upon, and the various expedients at our disposal when dealing with complications

I shall deal with certain conditions and illustrate them practically, not theoretically, by briefly rehearsing the history of an appropriate case, with some comments on technique

I shall sedulously endeavor to omit all non-essential details, only emphasizing such points in the history of my cases, or the operative technique, as exemplify the facts upon which I desire to lay stress, which in brief are (1) What can and should be done in certain classes of cases, (2) Why that which is most desirable in theory is sometimes both inexpedient and impracticable as a primary measure, although it can be resorted to successfully later, and (3) how purely palliative operations, under certain circumstances, will secure safely all the benefits that a more dangerous radical procedure offers

My first contention is that there are a certain number of the most desperate cases of perforative peritonitis of appendicial origin which can be saved for later radical procedures, provided much operative interference is avoided at the outset. How often have I regretted an exhaustive search for a perforation in cases where my surgical instinct should have taught

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<sup>1</sup> Read in its present form before the Saginaw County Medical Society, Michigan, December 5, 1905



me to simply drain, giving a possible chance for a late operation, instead of preventing any possibility of a late intervention by killing my patient in attempting to do an ideally complete operation. It is because it is so much harder to decide when *not* to do a given thing than when *to do* its opposite, that many of our operations fail to do any of the good that they are capable of effecting.

CASE I—The patient, C B, aged 20 years, was admitted to the University Hospital October 22, 1903, on the 21st day of an attack of appendicitis, with what appeared to be generalized peritonitis. The boy was in such a desperate condition it seemed hardly proper to intervene, but a rapid draining operation was decided upon and the usual oblique incision on the right side gave vent to large quantities of free pus intermixed with gas bubbles. My assistant made a corresponding opening on the left side and a stab wound in the same loin posteriorly, while I duplicated this on the right side. The bowel beneath my first wound was apparently gangrenous. The whole abdomen seemed to be full of pus, and was flushed out with many gallons of hot salt solution, and rubber-tube drains were passed through all four openings, with an additional cigarette drain placed in the deep pelvis, and a strip of iodoform gauze carried up to the under surface of the liver. These last two drains were removed in forty-eight hours, when all four openings gave exit to fecal matter. After a hard struggle the boy recovered enough to be walking about the wards, but the fecal fistula would not close. Accordingly on January 22, 1904, the abdomen was entered and the adherent margins of the opening into the bowel were separated from the abdominal parietes. In separating some adherent loops of small bowel three perforations were made, two of which were at once closed by a double row of sutures, one including all the coats, the others being seromuscular. The third perforation was just below the ileocæcal valve, the large opening into the colon being just above the valve, leaving only a bridge of tissue between. I therefore resected a V-shaped portion of the colon and ileum, including the ileocæcal valve, and united the cut edges transversely by a row of through-and-through stitches, which were then buried by interrupted seromuscular sutures, reinforcing

the anastomosis by lightly catching the omentum down over it by a few stitches After a rather serious course he convalesced, leaving the hospital March 7, 1904, well

A search for the opening or openings at the first operation would undoubtedly have killed this lad Still further, could the gangrenous areas of bowel have been quickly and easily reached, no stitches would have held, extensive resection would have become requisite, and the patient, I am confident, could not have survived any such procedure, but by free drainage and irrigation he was preserved for a successful secondary resection.

The second case which I shall quote is one which probably will be claimed by some to also show how previous chronic lesions, such as old ulcers of the gastro-intestinal tract, frequently serve as starting points for malignant disease This case also shows that even the experienced practitioner, still more the tyro, should carefully consider all possibilities in every case of trouble located in the right iliac fossa, and not off-hand decide that every patient suffering from pain and a mass in this region has appendicitis

CASE II—C W B, aged 65 years Entered the University Hospital March 15, 1904 His history in brief was, that he had had pain in the appendicular region with a tender mass detectable by palpation just outside the crest of the ilium This mass was dull on percussion, smooth, somewhat movable and was said to disappear at times, by which was probably meant that difficulty was experienced in recognizing it, owing to its change of position from distention of the bowels with flatus and the consequent increased rigidity of the abdominal muscles, which were always somewhat tense He had had two alleged attacks of typhoid fever when serving in the army during the Civil War, diarrhœa, lasting three or four months, followed each attack, succeeded by pronounced constipation, which latter symptom persisted up to the time of onset of the present trouble This was sudden, consisting in a severe attack of pain in November, 1902 This lasted but a few hours, but in February, 1903, another more severe attack occurred, a small tumor being detected by

his physician the next day Neither fever nor vomiting ever occurred during these or the subsequent attacks, which were frequent, but during the intervals some pain and the tumor persisted In May, 1903, a severe attack of pain led his physician to prepare him for an appendectomy, but rapid improvement led to postponement of any operative interference His old constipation gradually increased, but there has never been any pronounced symptoms of obstruction, unless the paroxysms of pain resulted from interference with the free passage of flatus and feces Since the latter part of December, 1903, the right-sided pain has been worse and interfered with his sleep A diagnosis of carcinoma of the cæcum was made, founded chiefly on the presence of a steadily enlarging but movable tumor unattended by fever, and the symptoms of what was believed to be partial obstruction March 21, 1904, by an incision parallel with the right rectus muscle, after an exceedingly difficult operation of over two hours' duration, the caput coli, the ascending colon and some inches of the ileum with numerous mesentric lymph-glands and much infiltrated mesentery were removed, and the cut ends of the intestines were united by several rows of interrupted silk sutures, the first including all the coats of the bowel, the others being seromuscular The omentum was brought over the line of suturing and a cigarette drain introduced Despite the formation of a slight fecal fistula, recovery promptly took place, the patient leaving the hospital May 24, the wound soundly healed, when last heard from he considered himself well The technique in this and the succeeding operations being in no way peculiar, the details are omitted

The next four cases present certain features in common to which I would call attention There were widespread adhesions between the neoplasm and other viscera, the cases where the bladder was concerned demonstrating its involvement by suggestive symptoms before operation Adhesions of a neoplasm to other organs seem to be at times purely inflammatory and do not necessarily mean neoplastic infection, although this is too often the case To properly deal with either malignant or tubercular processes within the abdomen it is often impossible to avoid superficial or even penetrating

damage of the hollow viscera, but this can be readily repaired and should not deter us from radical procedures. Again, the admirable advice to resect the mesentery in such a way that a well vascularized portion is left projecting beyond the cut end of the intestine is often absolutely impossible to follow, with the thickened infiltrated mesentery met with in many cases. Finally, the end-to-end anastomosis of the small with the large intestine often leaks, despite all precautions taken, because of the portion of colon often found uncovered by peritoneum between the layers of the mesocolon.

CASE III — *Adeno-carcinoma of the transverse colon and sigmoid*. Death. Mrs L T, age 56. Health apparently good until the last few months, when she experienced pain in the left lower abdomen and a physician detected a tumor. Vomiting and nausea immediately set in, attributed to medication, with frequent, painful micturition, some incontinence, and the urine was "deep red," malodorous, a heavy sediment being thrown down. The vesical symptoms lasted only two months, producing much loss of sleep and flesh, but the urinary symptoms had nearly ceased on her admission to the hospital. Omitting details, an irregular, freely movable tumor as large as the fist, was made out in the left inguinal region, which was not attached to the uterus. The proctoscope could be passed up beyond the growth, which could be moved over the anterior surface of the instrument.

November 7, 1904, I delivered through a vertical incision, made by splitting the outer portion of the left rectus muscle, a mass of intestines and omentum adherent to the bladder, from which separation was finally effected without penetration of this viscus. A loop of adherent small intestine was slightly torn during the separation and was at once repaired by celluloid thread sutures. The tumor was now seen to consist of the splenic flexure of the colon, which had become adherent to the sigmoid, necessitating the removal of several inches of bowel in both localities, as the remains of the sigmoid and transverse colon could not have been brought together if the two diseased areas had been excised with the intervening ascending colon. The union at both points of resection was made end to end by celluloid thread sutures and proved mechanically competent on the post-mortem eight days later, when the bowel at the upper anas-

tomosis was found gangrenous and perforated. Several free movements of the bowel had been secured before perforation took place.

Unquestionably it would have been much better to have made a right-sided colostomy instead of resecting, but so much damage had been done while determining the exact condition of the parts that resection seemed imperative. If I meet with a similar case I shall resect both diseased areas, make an anastomosis at the site of the lower resection, and establish a temporary colostomy by securing the ends of the bowel resulting from the upper resection in an incision of the abdominal wall. This would probably enable the anastomosis to heal securely, while later the colostomy could be safely closed by a secondary operation.

Another common error is to fail to recognize that malignant disease of the bowel does occur with sufficient frequency in the young to demand careful consideration when the clinical symptoms and signs point in this direction, as is demonstrated by Case IV, where the disease probably commenced during the latter part of the patient's eighteenth year.

CASE IV—*Carcinoma of cæcum*. Recovery. M. R., aged 20 years, was admitted to my service May 3, 1905, with a history of attacks of sharp pain during the last year located in the umbilical region. He was occasionally nauseated and had vomited some six times in all. The pain on each occasion lasted only two or three hours. He was able to work until three weeks before admission. Constipation existed, but no pronounced obstructive symptoms. Fever was absent.

A tumor to the right of the umbilicus was detected by my assistant, Dr. Darling, who operated at my request and in my presence on May 16, 1905. A vertical incision, splitting the right rectus muscle, was made from above the umbilicus nearly to the pubes. The omentum was adherent to a large mass consisting of small intestine, cæcum and ascending colon, the mass extending well down into the pelvis behind the bladder. After clamping, the caput coli, ascending colon and small intestine to the extent of thirty-five inches was removed, with the correspond-

ing mesentery A Murphy button reinforced by interrupted silk sutures secured an end-to-end anastomosis Convalescence was fairly smooth and the patient left the hospital June 14, 1905, with sound healing, but with retention of the button in the sigmoid, it was believed, on the evidence of a skiagraph

CASE V—*Massive tuberculosis of large intestine and ileum* Recovery E H, aged 39, entered the University Hospital May 22, 1905, having first noticed occasional abdominal pain late during the summer of 1904, but toward the end of November, 1904, he was attacked by severe pain in the right inguinal region with repeated vomiting Nothing new was noticed until about Christmas time he had a sharp attack of diarrhoea On January 21, 1905, his physician detected a small tumor which could not always be made out, according to patient's statement, but on my examination a large somewhat movable mass was detected in the right lower abdomen May 25, 1905, I delivered by an incision splitting the right rectus muscle a series of nodular, papillary tumors involving the caput coli and small intestine, forming a large adherent mass, with apparently healthy intervening areas of small intestine The lumen of the colon was almost closed, the bowel walls being enormously thickened by an infiltration which could only be distinguished from schirrus by the microscope, indeed macroscopically, the pathologist thought it was scirrhus The involved areas were removed with the corresponding mesentery, comprising the caput coli, ascending colon and small intestine, measuring  $36\frac{1}{4}$  inches A Murphy button was employed for an end-to-end anastomosis, reinforced by interrupted celluloid thread sutures A fecal fistula formed at the end of about a week but promptly closed, leaving however a tubercular fistulous tract which now discharges so little as only to require an occasional dressing He passed the button on the 21st day and has recently resumed his work as a stationary engineer

CASE VI—*Carcinoma of the caput coli* Recovery F D, age 38 years, entered the University Hospital June 3, 1905 In February, 1905, he frequently had severe pains, as he described it, "in the stomach," commencing shortly after eating, these attacks of pain continued for two weeks, the intensity varying from time to time This pain prevented him from working, but

after the lapse of some weeks he became so free from discomfort that he resumed work, but in the first week of May, 1905, while working he experienced a sudden pain to the right of and below the umbilicus, which ceased after a day's duration, but he now detected a swelling in the painful region. Another period of freedom from pain obtained until November 28, when severe paroxysms recurred, to be repeated on the next day, and on May 31st. The patient failed to note any increase in the size of the tumor, but it was extremely tender on pressure, there had been neither fever, vomiting nor constipation. On June 7 I opened the abdomen by splitting the right rectus muscle and removed nearly all the ascending colon, the caput coli and a number of inches of the small intestine, the measurement not having been reported to me. End-to-end anastomosis was effected by a Murphy button reinforced by sutures, the button was passed on the tenth day. Convalescence was smooth and the patient was discharged well on the twenty-first day.

CASE VII—*Carcinoma of the Sigmoid* Recovery Mrs S, age 50, entered the University Hospital February 3, 1905. About one year ago she began to feel weak, but nothing definite was noticed until an attack of severe pain in the right side occurred last spring, followed by a bloody mucous fluid which still continues to be discharged during evacuations of the bowel. Marked constipation developed, and the pain was now constant, extending down the left leg, but this had been absent until one week ago for three months. Examination of the abdomen revealed a tender mass in the left inguinal region unconnected with the uterus, it was irregular in contour and was slightly movable. The mass extended somewhat deeply into the pelvis. On February 20, 1905, I introduced my hand into the abdomen through an incision splitting the outer side of the left rectus, and found an inoperable malignant tumor of the descending colon inextricably fused with the adjacent parts. It was located too high for a colostomy, and it was desirable to avoid the discomfort of such an operation, so it was decided to make a lateral anastomosis between the splenic flexure and sigmoid portion of the colon, which was effected with some difficulty by means of a Murphy button reinforced by interrupted celluloid thread sutures. Prompt recovery ensued, the button was passed on the

twelfth day and she returned home March 21, with relief of all her symptoms

CASE VIII—*Carcinoma of the Sigmoid* Recovery M B, aged 55 years, entered the University Hospital September 14, 1904, having noticed some constipation since the previous spring Ten days ago he had the last satisfactory movement of the bowels and one slight movement three days later, but some time during the previous Sunday he began to vomit a bitter material rather frequently, but since entering the hospital emesis occurred but once, the abdomen was considerably distended Dr Darling in my absence explored by a median incision but was unable to locate the site of obstruction on account of the great distention of the intestine Accordingly he punctured a loop of the large bowel giving vent to much flatus, the opening then being closed with silk sutures This procedure permitted access to the obstruction in the upper portion of the sigmoid but not enough for removal of the carcinomatous mass, so a colostomy was done without any effort to make a spur Convalescence having been thoroughly established, after temporary suturing of the colostomy opening to secure asepsis, an incision to the inner side of the left rectus was made on October 6, 1904, when I resected without any special difficulty the carcinomatous mass, employing a Murphy button to reunite the bowel At one point the transverse colon was firmly attached to the bladder, probably where the bowel had been punctured at the first operation to get rid of the distention, a small opening resulted, which was closed with celluloid thread sutures Convalescence was prompt and satisfactory, the patient leaving the hospital November 9, 1904, with a small fecal fistula alone representing the large colostomy opening, this opening was subsequently (January 28, 1905) cauterized with the Paquelin cautery, after which the opening quickly closed Owing to carelessness the button was not detected in the stools, but repeated X-ray examinations show that the button has been passed

This case illustrates several important points, viz, the occasional impossibility of primarily removing the cause of obstruction in the large bowel even when the condition of the patient permits of prolonged manipulation, because of the dis-



tention of the whole intestinal tract, the failure of puncture of the bowel to remove enough of the intestinal contents to be of service, while a colostomy will in time permit one to gain free access to an obstruction which originally seemed inaccessible, and the invincible tendency of an artificial anus to close if no spur is formed as soon as all stricturing of the bowel is removed

This is the last case which I shall quote, although I could readily add to the list, but I think that single and double resections, side-tracking, temporary drainage of the bowel and permanent intestinal fistulæ, union by suture and by mechanical devices and omental grafts have all been illustrated, and that in principle the whole of the modern surgery of the large intestine has practically been covered by these cases

In conclusion, let me emphasize a few facts, some of which are well known but which seem to be forgotten by many practitioners, the first being that neoplasms of the large intestine give rise for long periods to little beyond what is called constipation by patients, and attacks of cramping pains with some passing distention, and that this may be all that has been noticed when during operation, or at the post-mortem, the lumen of the bowel seems incapable of transmitting feces Vomiting is a late or even absent symptom, but may suddenly supervene with all the symptoms of acute obstruction If the diagnosis was made earlier than it usually is, resection with a real cure would be common, instead of these late and too often useless operations We are too accustomed to disregard the possibilities of localized massive formations of tubercle with matting together of adjacent structures occasionally simulating malignant neoplasms, as seen in Case V, in a doubtful case tuberculin might settle this question Again, the desirability of opening the intestine to produce sufficient collapse to enable the operator to deal radically with a stricture in the presence of acute obstruction is questionable unless by this device side-tracking by a lateral anastomosis be rendered possible between a loop above and below the obstruction, otherwise colostomy or enterostomy is the only proper operation, moreover, a bowel incision may lead to dangerous adhesions, for instance to the bladder, as in Case VIII Too often the

attempt is made to eradicate malignant disease by free resection, when "side-tracking" would be equally efficient and productive of as much palliation as resection, with vastly less risk to life. Too much stress is laid by some upon the removal of the appendix and securing the opening into the bowel in all cases of perforation with pus formation. Although when this cannot be done death often follows, this result is more apt to be due to the precedent conditions, while occasionally a patient can be saved for a successful secondary operation by avoiding all primary radical measures, as in Case I. I can see no difference in the results between suturing and the Murphy button, provided care be taken in both instances to see that the portion of the large bowel uncovered by peritoneum has this membrane carefully drawn over the muscular coat by special sutures when the button is not used, or where this device is employed, by the over-and-over loop of the purse-string drawing both layers of the mesocolon together, as Murphy has so urgently directed, but which essential precaution is frequently neglected by other operators. The button usually takes less time to employ than suturing, although I rarely fail to pass reinforcing sutures, but for lateral anastomosis it is superior to suturing, while it can be successfully employed where sutures are out of court, *i e*, when one end or the ends of the bowel are bound down, thus preventing the free handling and ready access to all portions of the line of union so essential for securing suturing.

# A METHOD OF PERMANENT DRAINAGE OF BOTH KIDNEYS THROUGH THE LOIN IN CONNECTION WITH BILATERAL NEPHROSTOMY

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(An addendum to an article by the same writer published in the December number of the *Annals of Surgery*, 1905 )

IN the December number of the *ANNALS OF SURGERY*, there was published an article by me in which I endeavored to establish certain things in connection with a proposal to adopt a new and somewhat radical method for the surgical treatment of tumors of the bladder, the following being the more important of them

1 That the operative treatment of tumors of the bladder had been hitherto far from encouraging in its results The results were set forth in the form of an analytical study of a large number of cases reported by different surgeons of various countries, and were arranged with reference to the special kinds of operations that had been applied to the special kinds of tumors

2 That the reasons for the unusually large proportion of failures which had attended the operative treatment were as follows (a) The inadequacy of the less radical measures to the ends which they aim to secure, even in the cases of benign tumors (b) The too-tardy employment of operative measures (c) The failure and dangers of ureteral implantation

The assertions were supported by data consisting of a large number of cases

The following conclusions were expressed as those derived from the study of the subject

1 That ureteral implantation should be abandoned as a means for diverting the urine in connection with total extirpation or resection of the bladder in cases of vesical or prostatic

tumors, and that permanent renal fistula established by lumbar nephrostomy (unilateral in case of resection of the bladder necessitating the division of one ureter, bilateral, when both are involved), be substituted for it, and that the renal operations shall be done as a preliminary step to the operations upon the bladder, the latter being performed at whatever time subsequent to the nephrostomy the patient's condition should have become good enough to have them undertaken

In doing the nephrostomies, the ureters should be tied off as near as possible to the pelves of the kidneys

2 That total extirpation of the bladder should be performed at as early a period as possible after nephrostomy had been done in all cases of malignant tumors of the organ in which the disease had not exceeded the limits of the bladder or prostate and seminal vesicles, and in which there was believed to be no metastasis present This should be performed at the outset,—that is to say, it should not be preceded by some less radical measure in that class of cases, and the same should be done in all cases of benign vesical tumors which have occurred more than once

The writer proposed to have this plan applied only to patients in good circumstances who could care for the renal fistulæ properly

The dangers of nephrostomy *per se* were stated to be exceedingly small, and this assertion was supported by the results of a large number of cases in which the operation has been done

The inconveniences and distress attending renal fistula the writer believed could be avoided if a proper provision was made for draining the kidneys through the loin He cited one of his cases as an example of the successful employment of a simple and practical manner of arranging such apparatus, which was that of a man upon whom he had performed nephrostomy and established a permanent renal fistula on one side eleven years ago and who had had the same procedure carried out upon the second kidney by his colleague, Dr Thorndike, upon the other kidney four years ago This patient had worn the apparatus and passed all the urine for eleven years through the loin on one side, and during the last four years through the loin of both sides and from both kidneys Not only had the operations in each instance saved the patient's life, but he

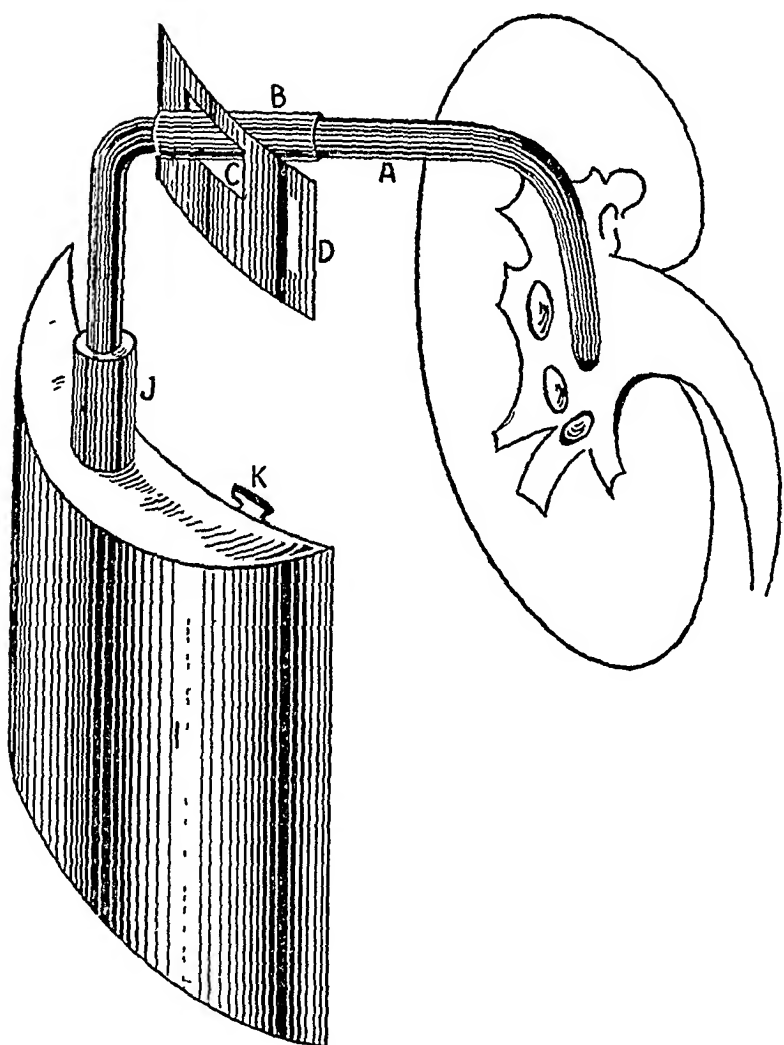


FIG 1—*a*, drainage catheter, *b*, rubber tubing which fits into orifice of fistula and held by horizontal opening in shield *c*, *j*, flask to receive urine, *j*, nozzle of flask into which outer end of catheter is passed, *k*, ring used to attach flask to hook on waistband (fig 3 *k*).

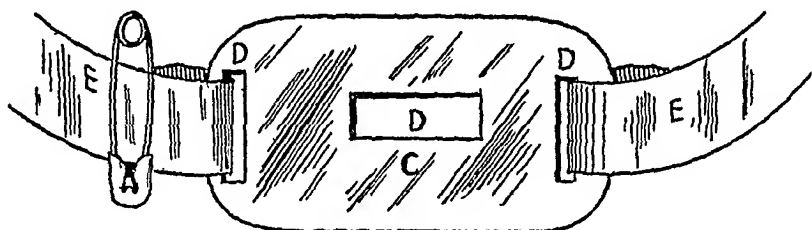


FIG 2—Shield with tape attached to the holes at its ends—*c*, Shield, *d d*, openings tape, *e e*, ends of tape band which attaches the shield to the patient's back.

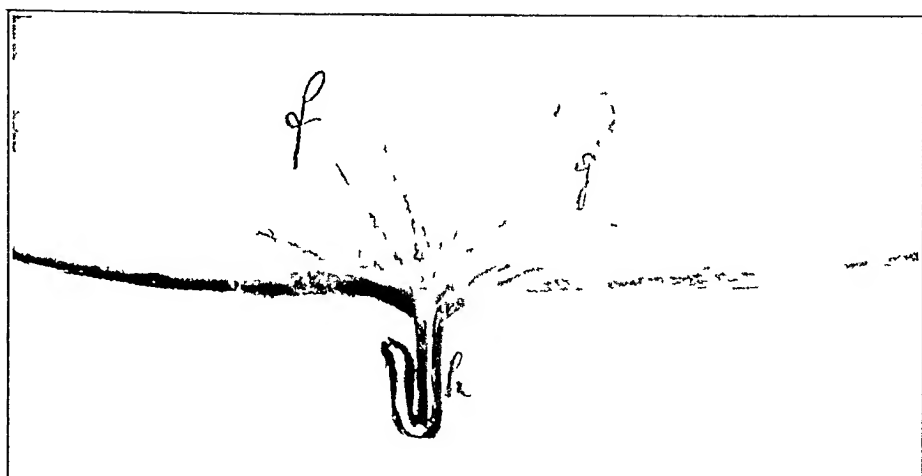


FIG 3—A bit of the wristband showing one of the hooks to which the reservoirs are attached and the hole through which one of the catheters is passed, *f*, wristband, *g*, hole for catheter *h*, hook



had been restored by them to entire health and to-day both kidneys are secreting approximately a normal amount of nearly normal urine. The patient is entirely comfortable, he is pursuing an active business life, not a drop of urine leaks around the drainage tube and consequently there is no odor and he is entirely dry. No one is aware of his condition. In short the patient's history subsequent to the operation shows that it is perfectly possible to so arrange drainage from permanent renal fistulæ as to secure for the patient health, comfort, active life and entire freedom from distressing conditions of any sort.

The apparatus by which this result has in this case been accomplished was not described in the writer's article published in the December ANNALS. A number of inquiries with regard to it have convinced him that it would be worth while to present it, with which intention the following description is given, with illustrations on opposite page.

The following articles compose the apparatus for draining the kidney. (In the illustrations, one of each of the different parts of the drainage apparatus only is designated, and is intended to serve as the example of all similar parts of it when these are duplicated for the double-sided drainage.)

- 1 Two red rubber drainage catheters (Fig 1a)

- 2 Two bits of rubber drainage tube each two and a half inches long (more or less, according to the thickness of the patient's back), and of a size to fit tightly upon the catheters and in the horizontal opening of the shield through which they are passed (Fig 1b)

- 3 Two hard rubber shields (Figs 1 and 2c) about three inches in length, two inches wide, and curved to fit the back. There are three openings in each of the shields ( $d$ ,  $d'$ ,  $d''$ , Fig 2), two perpendicular and one horizontal; the latter should be a little narrower than the rubber tubing  $b$  in order that it may compress the tubing firmly enough to prevent it, and the catheter which passes through it, from slipping to or fro. The former are long enough to admit tapes an inch wide.

- 4 Two pieces of strong tape or elastic webbing (Fig 2e). One end of this tape is attached to the outer of the two perpen-



dicular openings in the plate The tape should be long enough to pass around the body and is secured in the opening at the further end of the shield by safety pin or other device as may be preferred Elastic bands have the advantage, as compared with tapes, of adapting themselves to the movements of the body and thus keeping the shield constantly apposed to the back

5 A waist band (Fig 3f) long enough to go around the body and about four inches wide This band should be of stout material, its front ends are brought together by a couple of straps and buckles, on the lower border of the back of the waist-band are attached four stout hooks, and there are two holes to allow the catheters to be led through the band (Fig 3 g and h represent the part of the band showing the hook and one hole)

6 Two flasks, five inches long by four inches high by one and one half inches wide, curved to fit the gluteal regions, each having a nozzle projecting one inch above the middle of its top and just large enough to admit the ends of the catheters, and provided with a ring firmly soldered near either end of the inner side of the tops of the flasks (Flasks, Fig 1 i, nozzle j, rings k)

The flasks may be made of hard rubber, aluminum or any other suitable material having a surface that will not absorb the urine

*Precautions to be observed in applying the apparatus—* Before placing the apparatus upon the patient the points within the kidneys from which the ends of the drainage catheters will best drain the organs should be determined, and the catheters marked at the point at which they emerge from the mouths of the fistulæ, this mark will serve as a guide to show how far the instruments should be passed in and also where to place the bits of rubber tubing upon them The marks on the catheters should correspond to the middle of each bit of tubing

One other precaution must be observed with respect to the places of the ends of the catheters in the kidneys, viz, *they must not cause pain to the patient* This will be produced if the ends rest in the pelvis too near to outlet, and in my patient I have known a faulty position of the tubes call forth, though in a moderate degree only, the characteristic pain of renal colic

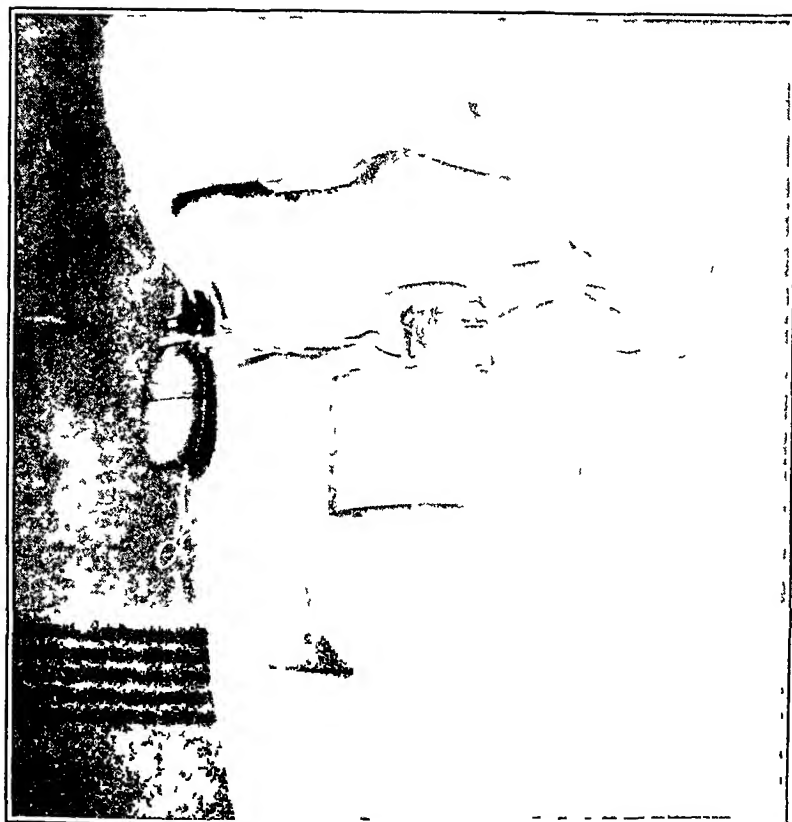


FIG. 4 Urine receptacles adjusted to receive secretion from kidneys

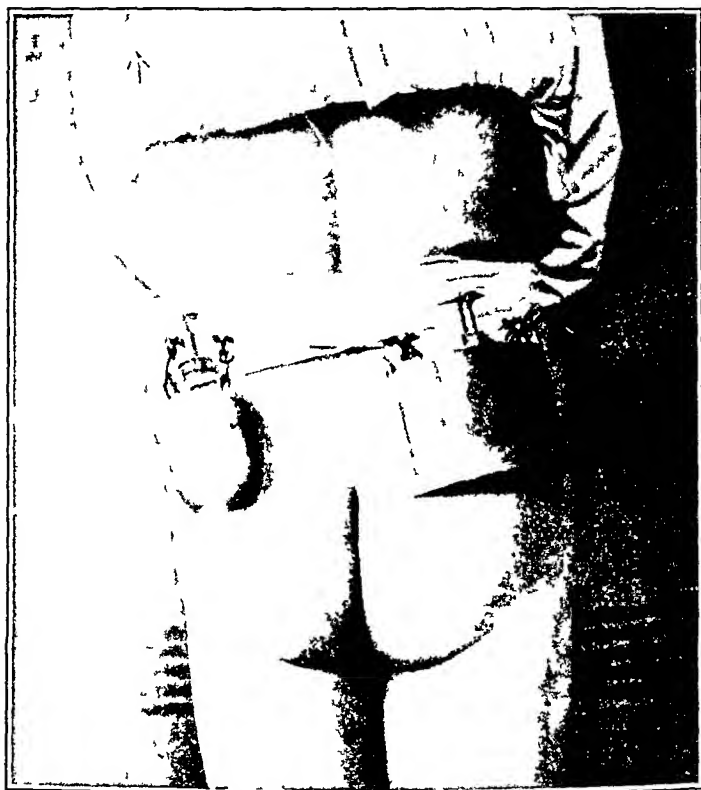


FIG 5 —Urine receptacles adjusted to receive secretion from kidneys, retention girdle applied

In what follows with regard to the manner of applying the apparatus, it is referred to as though but one side was to be drained, in order to make the description simpler and more readily understood

Enter the catheter, with its bit of rubber tubing properly placed upon it, into the fistula until one-half of the tubing lies within the mouth of the tract

Put the outer end of the catheter through the central opening in the shield and push the latter along the catheter and bit of tubing until it lies against the surface of the back. Then pass the free end of the tape (or elastic band) belonging to the shield around the waist and through the perpendicular opening in the other end of the shield and attach it securely there

The catheter is thus securely fixed in place so that it cannot be moved either inward or outward, as is shown on the right side of the back in Fig 4

Attach the waist band to the patient, passing the catheter through the opening in the back of it made for that purpose

Fasten the reservoir (flask) upon the waist band by passing the hooks upon the latter through the rings upon the upper edge of the former, and insert the end of the catheter into the nozzle of the flask (Fig 5)

When it is necessary to empty the flask, the patient can readily detach it himself

Every night the catheter which has been worn through the day is replaced by another, which should be boiled for fifteen minutes previous to its being used. The night catheter is replaced in the same way by the other in the morning. When this is done, the kidney and the fistula should be irrigated gently with warm sterile saline solution, permanganate of potash (one part to 5000 of water) or other bland cleansing fluid that the surgeon may prefer. The flasks should be boiled once every twenty-four hours, and thoroughly washed out at least once besides in each day

This is the form of apparatus which has been employed by me in the case of the patient referred to earlier in the communication, and with which he has been perfectly satisfied and comfortable. It requires care and attention to keep it clean,

and must be placed upon the patient properly if it is to answer its purpose. In considering the trouble that there is in taking care of such an arrangement it should be remembered that the conditions under which it would be employed are, or rather have been, desperate and if, after life has been saved by operative intervention, an apparatus can be devised whereby the patient is rendered entirely comfortable, as was the case in this instance, the matter of its being more or less troublesome to apply and to keep in proper condition is of very little importance in view of the benefits that have been obtained and the comfort and good health of the patient that have been secured.

The means by which the kidneys were drained in this case is only one of a number by which the same end might be attained, nor is it, in the writer's judgment, the most convenient form of apparatus that could be used for accomplishing it, but having had practical experience with this one, it has seemed better to describe it.

# CONTRIBUTION TO THE SURGERY OF THE KIDNEY.<sup>1</sup>

## CASES REQUIRING NEPHRECTOMY

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CASE I—*Renal Mobility with Tumour (Hypernephroma) causing Pyloric Obstruction, Nephrectomy, with relief of symptoms* A lady, aged 50, consulted me on March 1, 1905, for pain in the right side of the abdomen and extreme constipation. For four years she had been a complete invalid, unable to do any work, even such as the supervision of her house involved, and during the last few months of that time she had practically been confined to bed and only able to take fluid diet and semi-solids. Even with this extreme care in dieting she occasionally vomited, and the consumption of solid food practically always gave rise to vomiting. Rest in bed made the patient feel more comfortable, but even then indigestion was very troublesome and she had lost weight to an extreme degree.

On examination it was found that the stomach was dilated and proptosed, the lower border on distension reached nearly three inches below the umbilicus, no peristalsis could be observed or elicited. There was a rounded mass in the right loin, which appeared to be continuous with the lower end of the right kidney, from which it could not be separated, the kidney was almost entirely below the costal arch, was freely movable and could be pushed bodily upward with the tumour, but it could not be completely replaced in the loin.

It seemed doubtful whether the patient was the subject of an actual stenosis of the pylorus, or whether the displaced kidney and the tumour attached to it interfered mechanically with the pylorus and duodenum by dragging on these structures. To

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<sup>1</sup> Read at the meeting of the Midland Medical Society, December 6, 1905

enable one to deal with any condition present it was decided to open the abdomen anteriorly rather than to attack the renal tumour from the loin

Operation by incision through the right rectus The pylorus was not stenosed, as the index-finger could be invaginated through it The peritoneum was therefore divided over the right kidney to the outer side of the colon, and it was then found that there was a rounded elastic mass about the size of an orange connected with and partly enveloping the lower end of the kidney (Fig 1) The nature of the tumour was doubtful, and as it might prove to be malignant it seemed better on the whole to remove the kidney and tumour together rather than to do resection of the kidney Palpation of the left kidney showed that it was a healthy and well-formed organ, and nephrectomy was therefore performed. The tumour was found to be closely associated with the second part of the duodenum, so closely, in fact, that the outer coats of the intestine were injured and required suturing

A good recovery followed the operation and within three weeks the patient was able to take solid food, meat and vegetables, in carefully administered quantities

I have not seen her since she left the Nursing Home, but on inquiry by letter learn that she is immensely benefitted, though she still gets indigestion and flatulence, she has gained weight and is able to get about and do a certain amount of work, and she speaks of "her wonderful health in comparison with that of the last few years"

The inability of the stomach to discharge its functions and the resulting wasting may have been brought about either reflexly by the weight of the kidney and tumour dragging on the renal plexus, especially in the vertical position, or by kinking of the duodenum from the sagging downward of the tumour, which was closely attached to the second portion of the bowel On the whole I am inclined to regard the second explanation as the correct one

The association of renal mobility with dilatation of the stomach is not rare, and the question often arises, are these two displacements simply the results of a common factor, or



FIG 1 —Showing the kidney unopened with the tumor at the lower end





FIG. 2—Showing a section of the kidney and growth

does the first stand in causal relation to the second? The symptoms present are often those of neurasthenia, with vague pains and discomforts and stomach indigestion. Are the symptoms due to the descent of the kidney, or is the stomach to bear the onus of them? The answer is often difficult, but the case just related appears to shew that the drag of an unusually heavy kidney may be sufficient to interfere mechanically with the emptying of the stomach.

The removed specimen is in the Museum at the University, and I have to thank Dr Hewetson, curator of the surgical portion, for the following account of the pathology of the tumour and for the photographs which illustrate it.

**REPORT**—The tumour is situated within the capsule of the kidney and occupies the lower half of the entire organ (Fig 2). It is roughly pear-shaped, the apex being uppermost, and has the following dimensions: Length (vertical) 8 cm, breadth (lateral)  $5\frac{1}{2}$  cm, thickness (antero-posterior) 6 cm. The growth is definitely circumscribed by a dense fibrous capsule which separates it clearly from the kidney tissue above. The tumour substance resembles in appearance that of a deciduoma malignum, and consisted when fresh of a maroon-coloured spongy tissue with small areas of a firmer pinkish medullary tissue.

There are no visible trabeculae passing from the capsule into the interior of the growth, and it can be stripped away from the capsule without much difficulty.

The naked eye appearances are those of a localised tumour beginning in the kidney tissue and presenting extensive areas of necrosis, or of old blood extravasation. The kidney tissue above the tumour, measuring about  $8\frac{1}{2}$  cm in length, is to all appearances healthy. The capsule of the kidney can be readily stripped from the renal parenchyma, but is very adherent to the tumour.

The ureter is normal, the renal pelvis is slightly dilated. The renal vessels exhibit no special peculiarity.

*Microscopical Characters*—A section was taken opposite the upper part of the tumour, involving an area equal to about one-third its diameter. Externally there is a dense capsule consisting of concentric layers of fibro-muscular tissue, within this are layers of fibrous tissue in whose meshes are flattened kidney

tubules representing the kidney tissues which had become flattened and attenuated by the slow expansion of the tumour. Within this again is a further concentrically-arranged fibrous layer representing probably the capsule proper of the tumour. From this layer very delicate septa pass into the soft substance which comprises the new growth. This consists mainly of masses of old blood-clot shewing red corpuscles, white corpuscles and granular debris. The pinkish islets of tissue previously mentioned indicate the real nature of the growth, and this consists of epithelial cells cubical or polyhedral in shape arranged as delicate papillomata (Fig 3). Each papilloma consists of a thin stem of areola-fibrous tissue covered by a single layer of cubical or polyhedral cells containing clear transparent protoplasm and a well-stained nucleus situated about the middle of the cell (Fig 4). The delicate papillomata are arranged in a complex dichotomous manner. The tumour is very vascular, being supplied with large thin walled sinuses within the substance of the tumour and by large thick walled vessels within the meshes of its fibrous capsule. There is evidence of extensive extravasation, which cutting off the blood supply from large areas of papillomata, these have become degenerate and necrotic. There is no evidence of cyst formations within the tumour.

It would appear that this type of tumour, though moderately well known to pathologists, is little if at all known to surgeons. It has previously been regarded as adenoma, lipoma, angioma, endothelioma and carcinoma of the kidney. In 1883 Grawitz asserted that this type of growth was developed from misplaced portions of suprarenal tissue, and not from uriniferous tubules or the endothelium of lymphatics.

This view of Grawitz is generally accepted now and the tumour has been called by such names as Hypernephroma and Struma suprarenalis.

A critical review of this type of growth was given by A. O. J. Kelly (*Phil Med Jour*, July 30 and Aug 6, 1898), they are always soft and marrow-like and invariably definitely encapsuled. Occasionally they grow to a considerable size. They rarely produce hæmaturia, they are prone to interstitial hæmorrhages, they occasionally shew malignant characters,

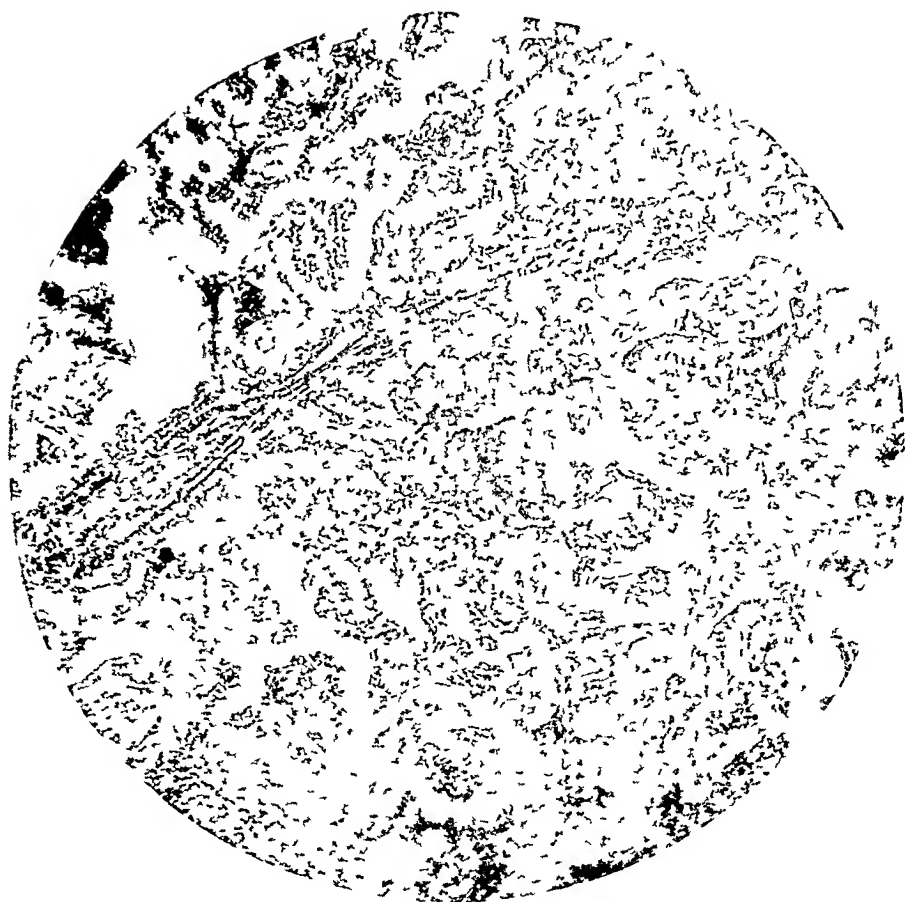


FIG 3 —Showing the complex dichotomous branching of the papillomata



FIG. 4.—Showing the character of the epithelium covering the slender papillary growths

giving rise to metastases in lung, liver and bones. Nearly all the reported cases have occurred in men and women between 40 and 50.

The next case is also one of great interest both from the clinical and the pathological standpoint.

CASE II—*Pyelo-nephritis and Ureteritis of uncertain nature Nephrectomy* Recovery. A male, aged 26, was admitted to the General Hospital in May, 1905, for pain in the left loin and down the course of the ureter. For some twelve years the patient had suffered discomfort in the penis after micturition, the urine being generally turbid. Six years ago this inconvenience became worse, pain in the back was complained of, the urine became more turbid and a deposit of mucus was noticed in the chamber. Still later pain was complained of in the upper part of the thigh. All these symptoms were present at the time of admission, but were none of them very acute, though from time to time they caused the patient to rest from work for a day or two. No enlargement at the kidney could be felt, but there was tenderness over the organ. Examination of the urine shewed a small quantity of pus but no blood crystals or tubercle bacilli. Cystoscopic investigation failed to shew any condition in the bladder which might explain the symptoms, the left ureteral orifice did not appear to differ from the right.

The patient was again admitted to hospital in September, 1905, with all his symptoms worse, willing now to submit to operation, as his disablement was increasing and he had not been able to work at all for some weeks. The urine at this time was acid, it contained pus, but blood crystals and tubercle bacilli were still absent.

*Operation*—The left kidney was exposed by the usual oblique lumbar incision, its pelvis was found to be dilated and much thickened but no calculus could be discovered. The ureter was then examined and found to be densely thickened and enlarged nearly to the size of the little finger at its upper part, gradually diminishing in size toward the bladder, though it was still unhealthy to within an inch of the organ. The diagnosis appeared still to be tubercular disease. The peritoneum was opened at the bottom of the wound and the hand passed across determined

the presence of the right kidney, which appeared to be free from any gross change. Nephrectomy and complete ureterectomy was therefore performed, as any less procedure did not promise to restore the patient to active work as a coach finisher. An easy recovery followed the operation and the patient is now well.

The method of examining the opposite kidney before proceeding to nephrectomy is one which is no doubt often resorted to by other surgeons, but it appears worth while calling attention to it, as it may not be generally practised. Complete ureterectomy was effected simply by enlarging downward and forward the lumbar incision, a method by which I have been able also to remove a calculus impacted in the ureter close to the bladder without making a second incision in the iliac region. In my experience there is scarcely any limit to what may be done in the way of removal of huge enlargements of the kidney and the ureter through this prolonged lumbar incision. If need be there is ample evidence in some of the cases I relate here of the wisdom of keeping kidney operations retroperitoneal rather than intraperitoneal whenever this can be done.

*Pathological note and photographs of the specimen by Dr Hewetson*—The capsule of the kidney is thickened but strips without much difficulty, the kidney pelvis is dilated and its walls thickened and indurated. The ureter has the calibre of a cedar pencil and possesses thickened walls. On section it is readily seen that the chief seat of the trouble lies in the pelvis and ureter, both are lined by a whitish granular layer, which largely accounts for the thickening and induration of their walls. No calculus can be discovered. The kidney tissue is of a pale pink colour and cuts very much like that of a lardaceous kidney, although there is no characteristic stain if iodine is applied. The cortex is not altered in size, the medulla is somewhat congested. There are no abscesses visible to the naked eye within the kidney tissue. At one or two points the granulation tissue lining the smaller divisions of the kidney pelvis appear to have burst into the medulla of the kidney and formed very small abscesses there. At the upper pole of the kidney there are one or two shrunken areas of kidney tissue shewing a brownish red colour on the sur-

face, these are probably either of a thrombotic or infarctic nature. The blood-vessels of the kidney are normal.

*Microscopical*—The kidney tissue everywhere shews advanced parenchymatous nephritis, with destruction of glomeruli and kidney tubules over extensive areas. This destruction is due no doubt to the infiltration of the interstitial tissue with small round cells which are diffusely arranged in both cortex and medulla. This inflammatory reaction is widespread and not arranged in tubercle formations.

The kidney pelvis and ureter are enormously thickened, this being due almost entirely to an inflammatory change in the mucous and sub-mucous coat. This consists of the breaking up of a thick layer of round cells chiefly of a mononuclear variety, which either lie in the sub-epithelial layer or entirely replace the epithelial cells. There are no giant cells anywhere and no suggestion of tubercle formations.

The nature of the pathological process is probably that of a sub-acute inflammation arising in the pelvis or ureter of the kidney and which has gradually spread to the kidney tissue. From the histological character of the sections of kidney tissue, pelvis and ureter, one would infer that this is probably an inflammatory process of a simple pyogenic nature and not of a tuberculous one, although no cause such as calculus was found to originate the condition.

CASE III—*Intermittent Hydro-nephrosis with extreme mobility of the kidney Nephrectomy* Recovery. This specimen was removed from a lady, 35 years of age, who had since early childhood suffered from attacks of pain in the right side of the abdomen and the right loin, pain which at times was very severe and caused vomiting and which for some years had been associated with a swelling in the right anterior renal region, the swelling from time to time subsiding with an increased excretion of urine which occasionally would be coffee-coloured, suggesting that there was blood in it. When I first saw the patient she had a swelling as large as a child's head, entirely below the costal arch on the right side and reaching back into the loin, it was fluctuating and freely movable, both vertically and laterally.

*Operation* by the usual oblique lumbar incision. After pal-



pating the left kidney in the manner I have already described and finding it plump and healthy and not unduly movable, the right kidney was removed, as it was found that the kidney tissue was reduced to a mere shell, there was hardly anything but the capsule left. The attachment of the ureter to the kidney pelvis was such that an incomplete emptying of the pelvis must have been habitual. It is of course in this case impossible to say whether the mobility was the first fault which so kinked the pelvis and ureter as to cause distension of the organ, or whether some congenital fault in the attachment of the ureter to the kidney pelvis was the first cause of the hydronephrosis and the intermittent emptying of the organ produced displacement of structures around and secondary mobility. I incline to think that the mobility of the kidney was the first step in the destructive processes that had gone on. Certainly this is so in some cases, of which the following is an example.

A year ago a lady, aged 45, was sent to me by Dr Roberts, of Dursley, with a history extending over thirteen years, of pain in the right side of the abdomen which came on after an acute illness. Ever since that illness from time to time there had been pain in the right side of the abdomen and the right loin, the pain was made worse by exertion, and it was also especially bad when the patient was tired, occasionally vomiting was associated with the pain. At times micturition was very frequent, and at others the patient was unable to pass urine without great difficulty. On examination the right kidney was found freely movable either in the recumbent, lateral or vertical positions, the left kidney could not be felt.

I performed nephropexy by the method I generally adopt, a modification of Goelet's, and found a considerable degree of hydronephrosis, so that nearly half the kidney tissue was destroyed, there was an abnormal renal artery at the lower pole of the kidney.

During the first few days after the operation there was great discomfort and dysuria. These symptoms were so severe that it appeared doubtful whether nephrectomy would not be required, but the acuteness of the symptoms gradually subsided, and when the patient got up at the end of four weeks she was perfectly comfortable and has remained so ever since.

A year after her operation she reported herself as feeling strong and well, and able to walk four or five miles without difficulty. She and her husband stated that the improvement in her health since the operation was marvellous, that she was now able to undertake duties which before were quite impossible for her, that her life was not only more comfortable but that mentally she was quite different, bright and happy, instead of being depressed and morbid.

I mention this case to shew that mobility may be an efficient cause of hydronephrosis and that fixation of the movable organ may suffice to prevent further deterioration of the kidney and at the same time give relief to the distressing symptoms.

The earlier part of this year I was consulted concerning the wife of a medical man who was very seriously ill from a right-sided pyonephrosis, associated with mobility of the right kidney. It appeared to me from the history in this case that there was some hydronephrosis due to movement and that infection invaded the distended organ, setting up an acute pyonephrosis. Happily the purulent collection eventually discharged itself down the ureter and the urine became almost, but not quite, free from pus after prolonged rest and treatment. Further examination of this patient shewed that both kidneys descend freely when she is in the upright position, and a past history of many years of indifferent health, weakness, exhaustion, and inability for a really active life points strongly to the mobility of her kidneys as the cause of her incapacity. Some three months ago I ordered her a double truss support to keep the displaced organs in position, and she is one of the fortunate patients who has derived very great benefit from this measure for she writes me, within the last few days, that her life is quite different since she has had the benefit of the instrument, and that she is now able to undertake duties that were before quite impossible for her.

I mention this case in conjunction with the preceding ones to point out one of the dangers to which patients with hydronephrosis are exposed, viz, to infection of the dilated

tract and resulting pyonephrosis, and I will illustrate this by referring to two other cases which possibly arose in this way

The two cases next reported are both examples of unilateral pyonephrosis, which appear to have arisen without the provocation of *calculus or tubercle*. Case IV was probably due to some congenital defect or displacement, for in this instance there is a long-continued history, beginning in young childhood, of attacks of pain in the left renal region associated at times with vomiting. In all probability hydronephrosis was set up which eventually became infected, pyonephrosis resulting. When the patient came under observation he was most gravely ill and the diagnosis, between an acute thoracic and acute abdominal condition, was very difficult. At this time he was far too ill to permit of any operative interference whatever the diagnosis might be, and it was hoped that by withholding operative interference he might struggle through to a more favourable period. This fortunately happened and it became clear that the condition was located in and around the kidney.

In Case V there was a marked contrast to the very acute and severe illness of the case just mentioned.

This patient was in comparative health and the renal swelling was discovered almost accidentally when he was still following his occupation and apparently without much inconvenience. Neither in the history nor in the removed specimen is it possible to trace the provocative conditions which set up pyonephrosis, but I suspect that in many of these unexplained cases there is in the first instance hydronephrosis either from mobility or from some malformation about the ureter or kidney pelvis.

*CASE IV—Huge Pyonephrosis and Ponephritic suppuration with acute symptoms, partly abdominal, partly thoracic. Lumbar Nephrectomy.* Recovery. A male, aged 25, was admitted to the General Hospital under the care of Dr Simon, September 7, 1905, complaining of severe pain in the left side of the chest and abdomen.

On the day of admission the patient had an attack of acute pain in the left side affecting the back, extending round to the

front of the abdomen and involving the lower part of the left chest where there was severe stabbing pain, worst on deep respiratory effort. When I first saw him the patient was extremely ill, pulse 140, temperature 102, respirations 44. The belly was rigid, the thoracic movements were slight and mainly of the upper part. The diagnosis was uncertain whether acute abdominal lesion or pneumonia with latent physical signs. The history that ever since five years old the patient had suffered acute attacks of pain in the left loin suggested that a plugged kidney with distension and infection spreading from it was the probable cause of the present illness. The delay of a few days materially cleared up the diagnosis, a few blood cells were found in the urine on two occasions, the pain and tenderness became more definitely localised over the left kidney, a large mass could be felt occupying the left lumbar region, the pulse fell to between 80 and 90, the temperature also falling somewhat and becoming of the hectic type.

Operation — Lumbar incision liberated a perinephritic abscess of some ounces and the kidney was found hugely dilated and extending up to the left arch of the diaphragm above and to the crest of the ilium below. It was shelled out without much difficulty, the vessels and ureter were ligatured separately. A bougie was passed down the ureter into the bladder and the tube was found patent. A good recovery followed.

Examination of the specimen shewed that the whole of the renal tissues were practically destroyed, the distended parts being filled with pus, and there was no evidence of calculus or tubercle to explain the condition found.

CASE V — *Large Pyonephrosis simulating a Hepatic Tumour*  
*Nephrectomy by abdominal incision*. Recovery. A male, aged 35, was admitted to the General Hospital on September 11, 1905, with a large abdominal tumour reaching from the right costal margin to the iliac fossa and extending laterally from the right side of the abdomen to some inches beyond the middle line. The swelling was very slightly tender, doubtfully fluctuating, it was mobile laterally, and descended somewhat on inspiration. There was stomach resonance over the inner and upper part of the swelling, colon resonance over the front of it could not be made out distinctly, and on palpation the hand could not separate

the upper margin of the swelling from the liver Bimanual palpation shewed that the swelling did not occupy the lumbar space as fully as was to be expected from renal enlargement There was no history of any recent inconvenience from the swelling, but the patient stated that he had suffered pain in the right loin three years previously and that his urine was turbid then Examination of the urine shewed a very few pus cells and the excretion of urea was something under 300 grains

*Operation*—Although there were some points suggesting that the tumour was renal, in view of the uncertainty of the diagnosis an incision was made over the front of the abdomen, when it was found that the tumour was free from the liver and that it was connected with the right kidney Part of the swelling was fluctuating, but a great deal of it appeared to be solid The peritoneum over the swelling was opened to the outer side of the colon, the colon and duodenum were stripped off the front and inner side and pushed toward and beyond the middle line During this manipulation a small collection of pus was liberated As the stripping proceeded it was found that the innermost part of the swelling was closely adherent to the inferior vena cava, which was separated with great difficulty but without a catastrophe The renal vessels were ligatured separately, the parts were restored to their natural position and the cavity left was drained by lumbar puncture and the anterior wound entirely closed Some large lumbar glands were removed, there being suspicion that the condition was really one of pyonephrosis with malignant growth

The report on the specimen by the pathologist, Dr Sawyer, shewed that the condition was one merely of pyonephrosis with great thickening in parts of the capsule of the kidney, and the lymphatic glands were also shewn to be free from growth There was no evident cause such as calculus or tubercle for the condition found

CASE VI—*Pyonephrosis with large perinephritic suppuration due to renal calculus Nephrectomy* Recovery A male, aged 58, was admitted to the General Hospital on October 7 with a large abdominal tumour on the left side which had been discovered recently, the man seeking advice because of a feeling of stiffness on the left side which caused him some inconvenience

when at work The left side of the abdomen was occupied by an elastic swelling, which extended from beneath the costal arch down into the iliac fossa, it reached to the middle line and filled the left lumbar space The swelling was not tender and was doubtfully fluctuating The time at which this swelling developed was quite uncertain, for the patient practically knew nothing of it, but he stated that twelve months before he came under observation he had suffered severe pain on the left side of the belly when he was in bed one morning and was sick for about twelve hours then Since that time he has had what he calls a feeling of bubbling in the left renal region pretty often The patient states that he has noticed his urine thick and cloudy for the last forty years, and he thinks that at one time he passed blood in it after cycling, he also noticed that he passed urine rather frequently during the day but not so frequently when at rest He was a well-nourished and muscular man, but his surface arteries were much thickened and tortuous The examination of the urine shewed constantly the presence of pus and there was a good excretion of urea, amounting to about 300 grains, on a light diet The diagnosis appeared to be pyonephrosis, probably from plugging by a stone, and nephrectomy was advised

*Operation*, October 16, by a prolonged oblique lumbar incision, which opened a perinephritic suppuration estimated at about two pints, the pus being of a peculiar mucus sticky feel but without odor The kidney was then defined and after much trouble a line of cleavage was obtained, but in the process of stripping the organ the peritoneum was widely opened and it was with much difficulty that the descending colon could be separated from the front of the kidney, indeed it was feared that some of its vessels had been disturbed, but subsequent events shewed that this was not so It was impossible to suture the opening in the peritoneum so the wound was partly sutured and partly packed with gauze, this latter precaution was especially taken in view of the possibility of necrosis of part of the colon wall from the disturbance it had suffered Happily the wound healed without any trouble whatever, the bowel remained sound, and the patient was discharged on November 10

The kidney was widely dilated and practically no renal tissue was left, the dilatation was found to be due to a calculus in the pelvis

# A NEW METHOD OF EXCISION OF THE KNEE WITHOUT OPENING THE JOINT<sup>1</sup>

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Excision of the knee for tuberculous disease is an operation associated with numerous disadvantages

Tuberculous material is smeared more or less over the wound, often an unavoidable occurrence, which becomes especially dangerous should there already exist some secondary infection at the time of operation. The danger of tuberculous infection of the wound needs but to be mentioned, neither is it necessary to emphasize what the effects of secondary infection might be.

The diseased synovial membrane and other joint structures are frequently extremely vascular, so that the act of excising these tissues is sometimes combined with annoying hemorrhage. The perpetual clamping of small bleeding points prolongs an operation which even under the most favorable circumstances demands considerable time. One does not like to use a tourniquet for any length of time, because of the effect on the nerve supply of the leg and the related subsequent oozing, often very annoying.

This time element is quite important in cachectic and feeble patients.

Any method of resection which depends in part for its success upon complete removal of all diseased tissue after opening the joint is occasionally going to fail because some small

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<sup>1</sup> Read before the New York Academy of Medicine, Surgical Section,  
December 1, 1905

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11



FIG 1 —Showing square skin incision



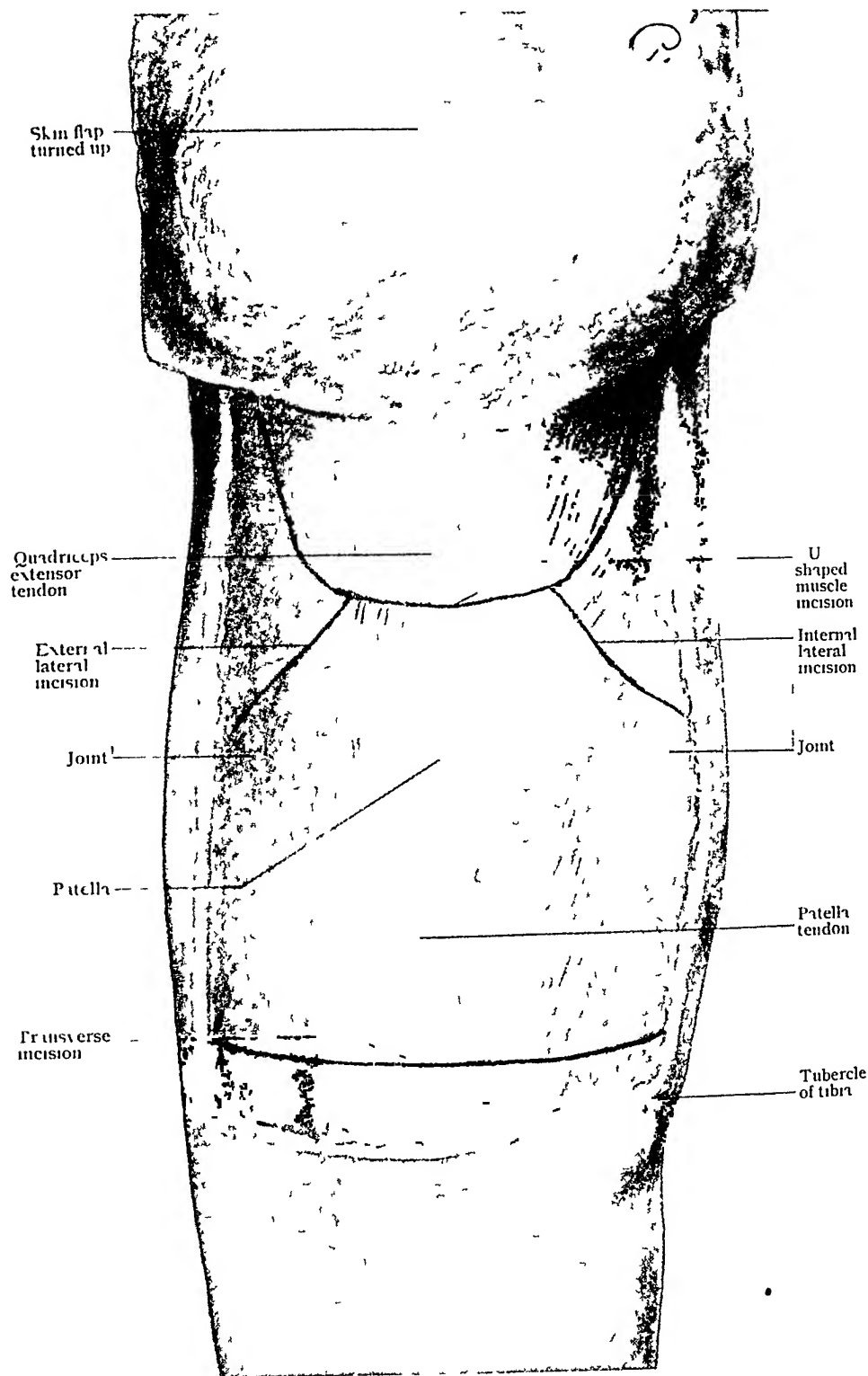


FIG 2 — 'U' shaped incision in quadriceps extensor Internal and external lateral incisions in fascial expansions of quadriceps Transverse incision over head of tibia

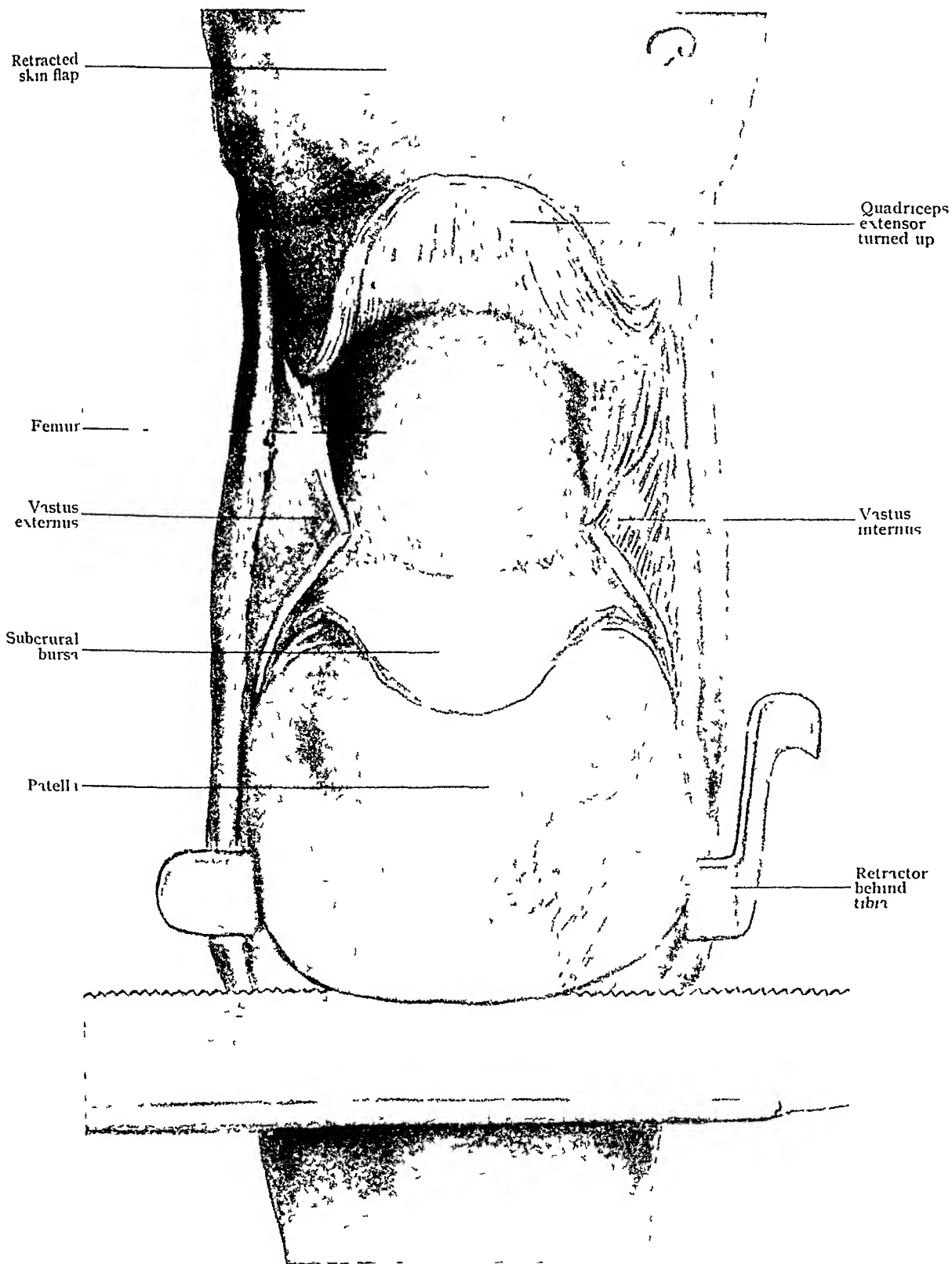


FIG 3—Muscle incisions Bursa turned down Retractor in place Saw cutting tibia

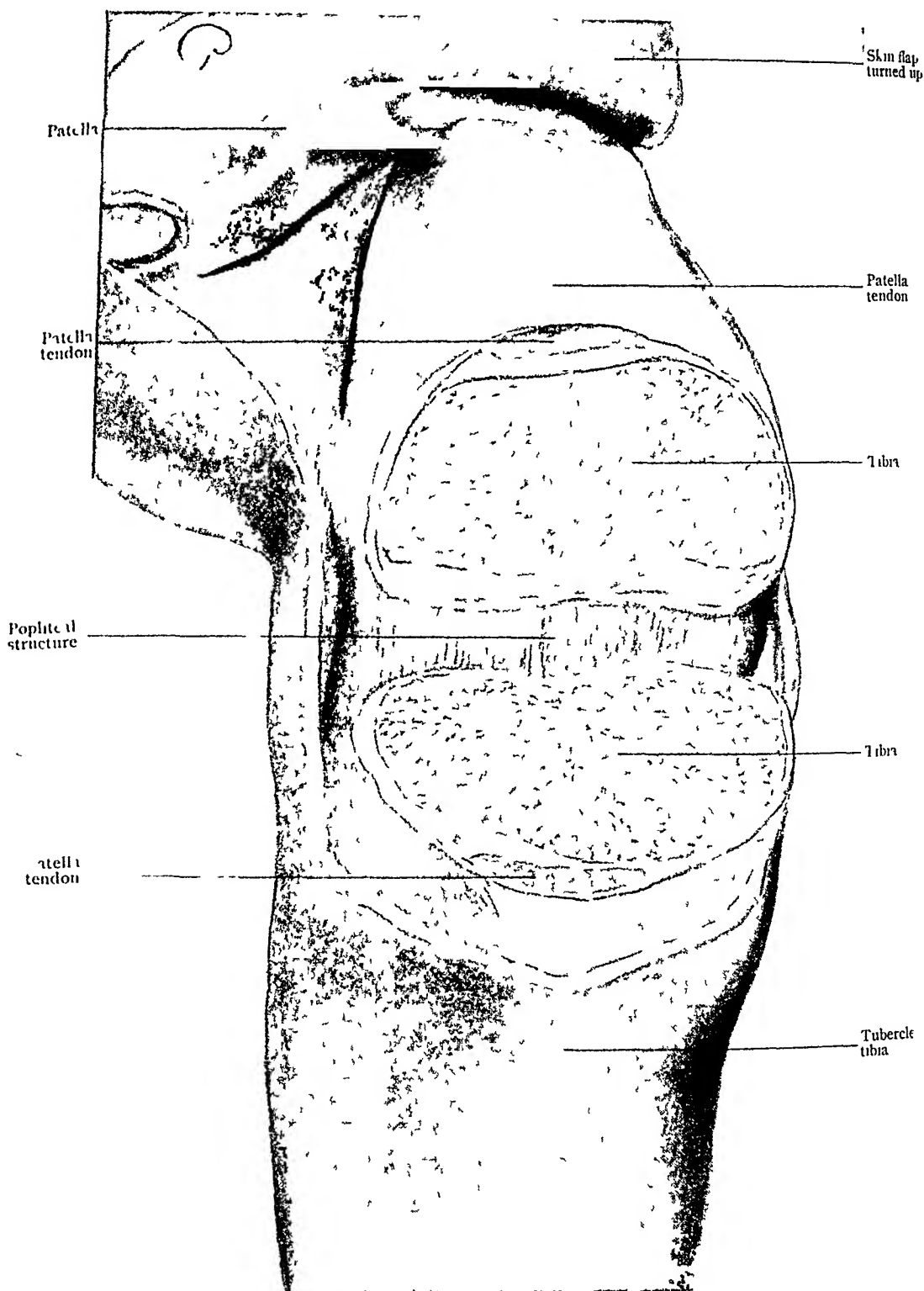


FIG 4—Tibia sawn through Leg flexed Structures at knee above fallen into place

portion of the joint not removed serves as a starting point for fresh ravages of the disease. Kocher's method does not open the joint, but is subject to the other disadvantages.

It has seemed desirable to the writer to perfect some technique which did not open the joint and which would do away with the above-mentioned annoyances, and at the same time combine the advantages both of operations which do open the joint and of Kocher's method. It is my opinion that the following operation fulfils these requirements.

The skin incision should be rectangular, the two vertical cuts being well back at the sides of the leg, extending from a little above the level of the upper limit of the subcrural bursa to one inch below the joint line. These two vertical incisions are connected across the front of the tibia by a transverse incision (Fig 1). This rectangular skin flap with the subcutaneous tissue is reflected upward.

The next incision is curved, the concavity upward. It starts in the vastus internus a little above the upper limit of the subcrural bursa and is carried down and outward in the direction of the muscle fibers to the tendon of the quadriceps extensor one-half inch above the patella, and from here upward and outward in the direction of the fibers of the vastus externus to a point corresponding to the beginning on the inner side. The muscle with the tendon is completely divided and turned upward, thus exposing to view the subcrural bursa. We next make two small incisions on either side of the femur, starting on each side of the patella in the incision just described, and carried downward and backward to the joint line. The one on the inner side divides the tendinous expansion of the quadriceps, the one on the outer side the tendinous expansion and part of the iliotibial band. After completing these incisions the subcrural bursa is separated from the femur with the knife and turned down, tilting the patella when not adherent. The last incision in front is carried transversely across the front of the tibia down to bone just below the joint line (Fig 2).

On the inner side the sartorius and gracilis are pushed back, on the outer side the biceps and peroneal nerve

A flat retractor about one inch wide is now introduced on the inner side behind the head of the tibia close to the joint line. It is first introduced vertically between the gracilis and sartorius on one side and the tibia on the other. These muscles are pried off and the retractor brought to a horizontal plane, the apex passing behind the tibia. This retractor is now pushed outward always close to the bone until it emerges at the outer side. All soft parts are thus held back.

The next step is to saw through the tibia as close to the joint as circumstances seem to warrant, the leg being still flat on the table, the retractor being in place protects the soft parts (Fig 3)

The saw-cut through the head of the tibia is used as a joint. The femur is flexed on the body, the leg on the femur (Fig 4), and with a large knife the soft parts are quickly separated from the posterior structures of the joint. By a little downward traction on the leg combined with the pull of its own weight injury to the vessels is easily avoided. This seems to be much more easily accomplished in this manner than by the operation which attacks the posterior structures of the joint from the anterior aspect. One has at least a better sense of security because one is perfectly sure of the relation of the vessels to the knife.

As soon as the posterior region of the condyles is exposed the femur is sawn through from behind forward and slightly downward at a level sufficient to clear the cartilage behind (Fig 5). This saw-cut is carried forward until it reaches the margin of the cartilage on the anterior surface of the femur, and the saw then withdrawn. The direction of this cut should be downward and forward so as to lose as little as possible of the femur and obtain the desired slightly flexed position of the bones subsequently. It is easy to be deceived as to the exact position of the cartilage behind. One's examination should be particularly careful at this stage of the opera-

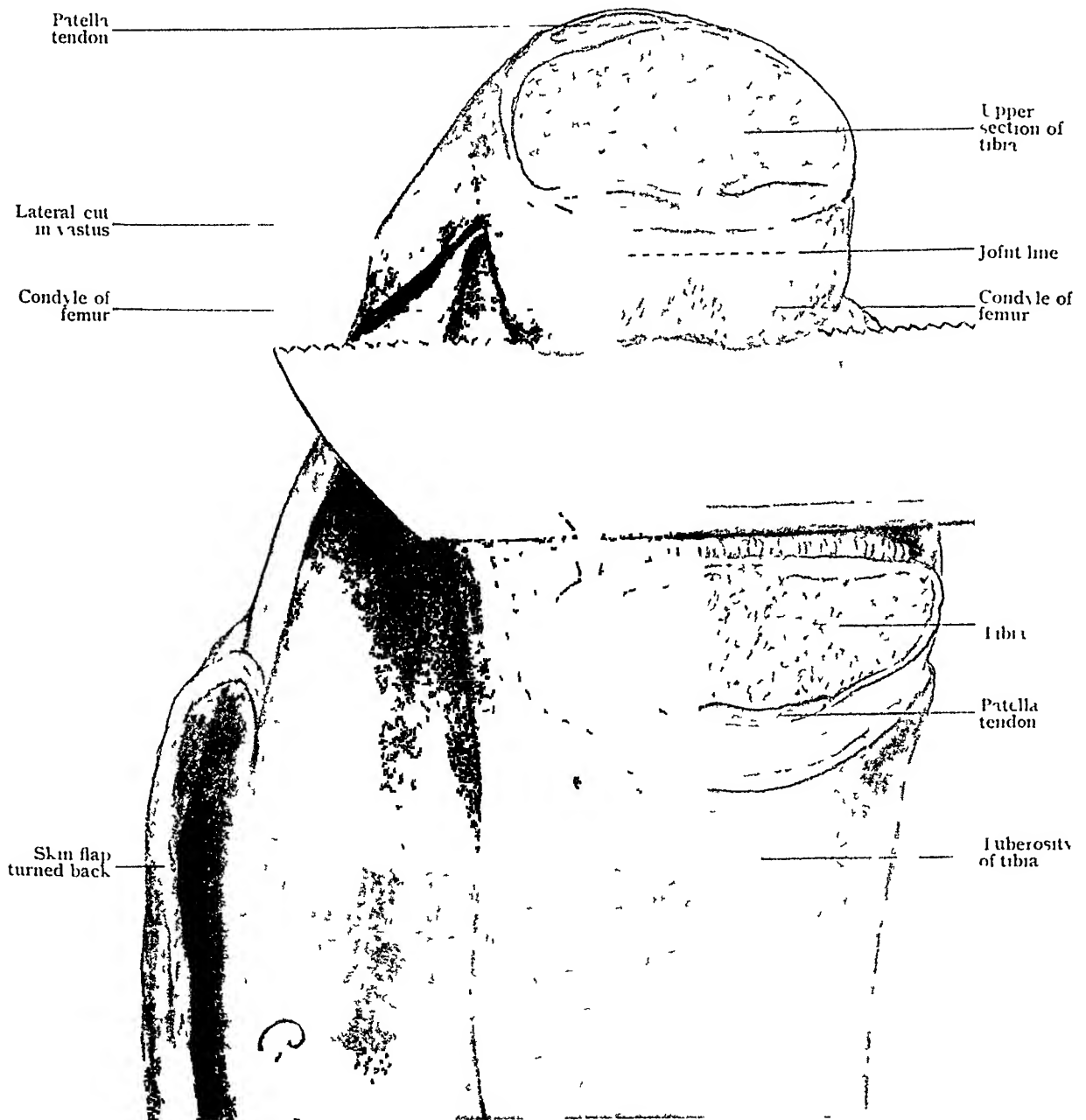


FIG. 5.—Leg flexed on thigh—Condyles exposed Saw in place for section of femur

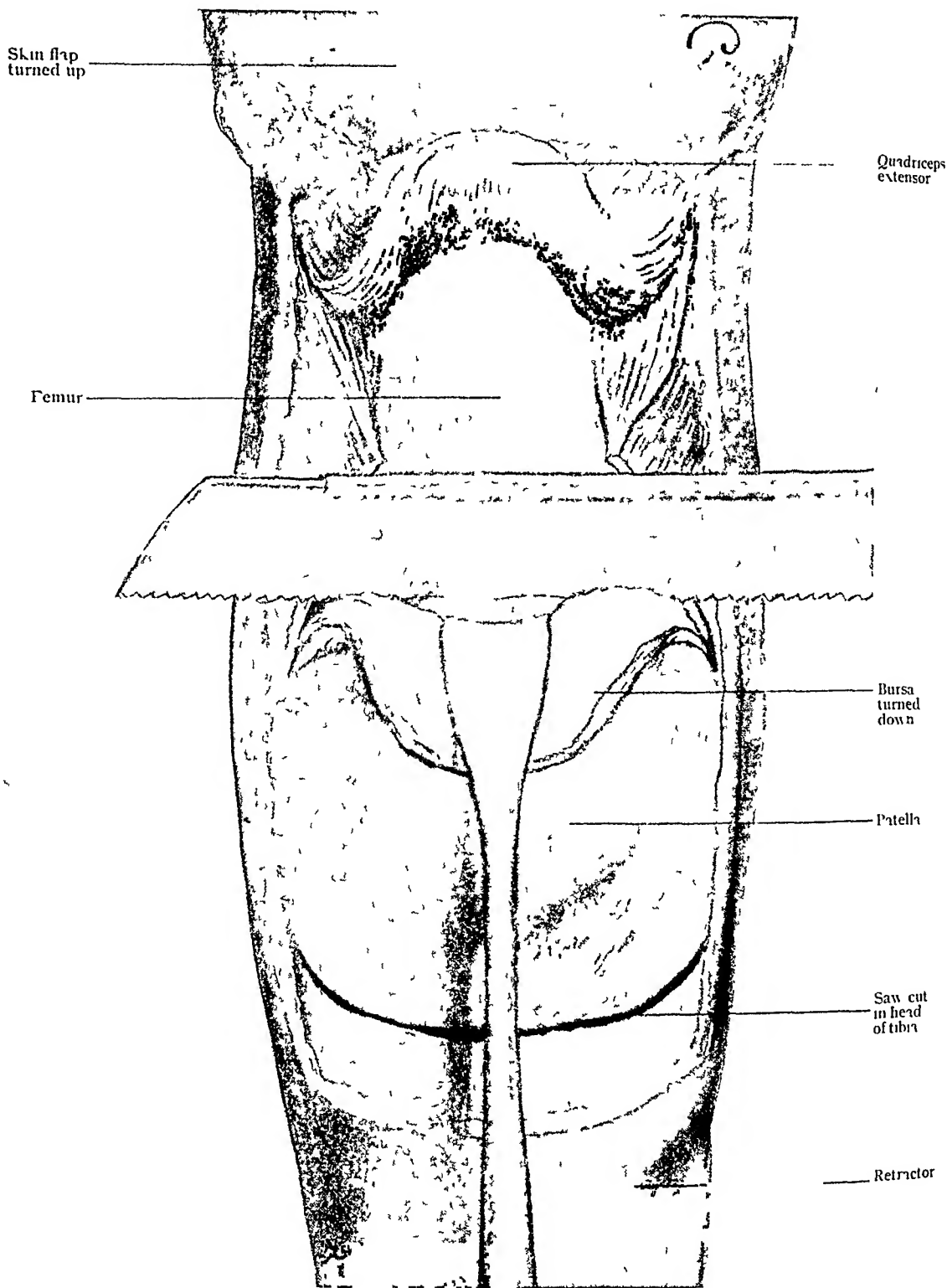


FIG 6 —Leg horizontal Bursa pulled down Saw in place to remove trochlear surface of femur

Subcrural  
bursa

Patella

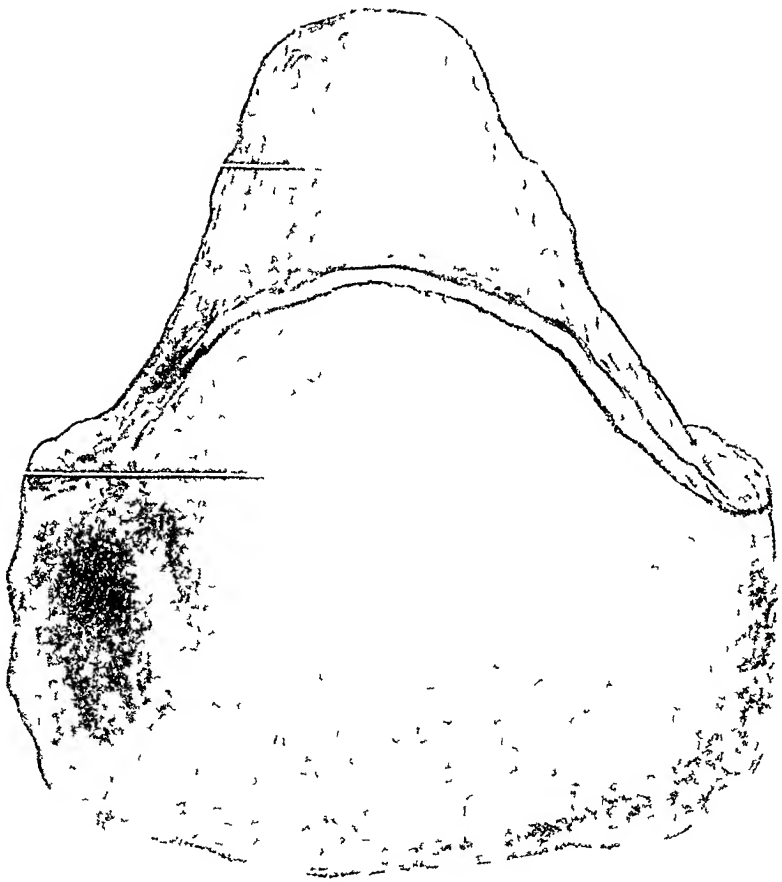


FIG. 7—Joint removed without opening



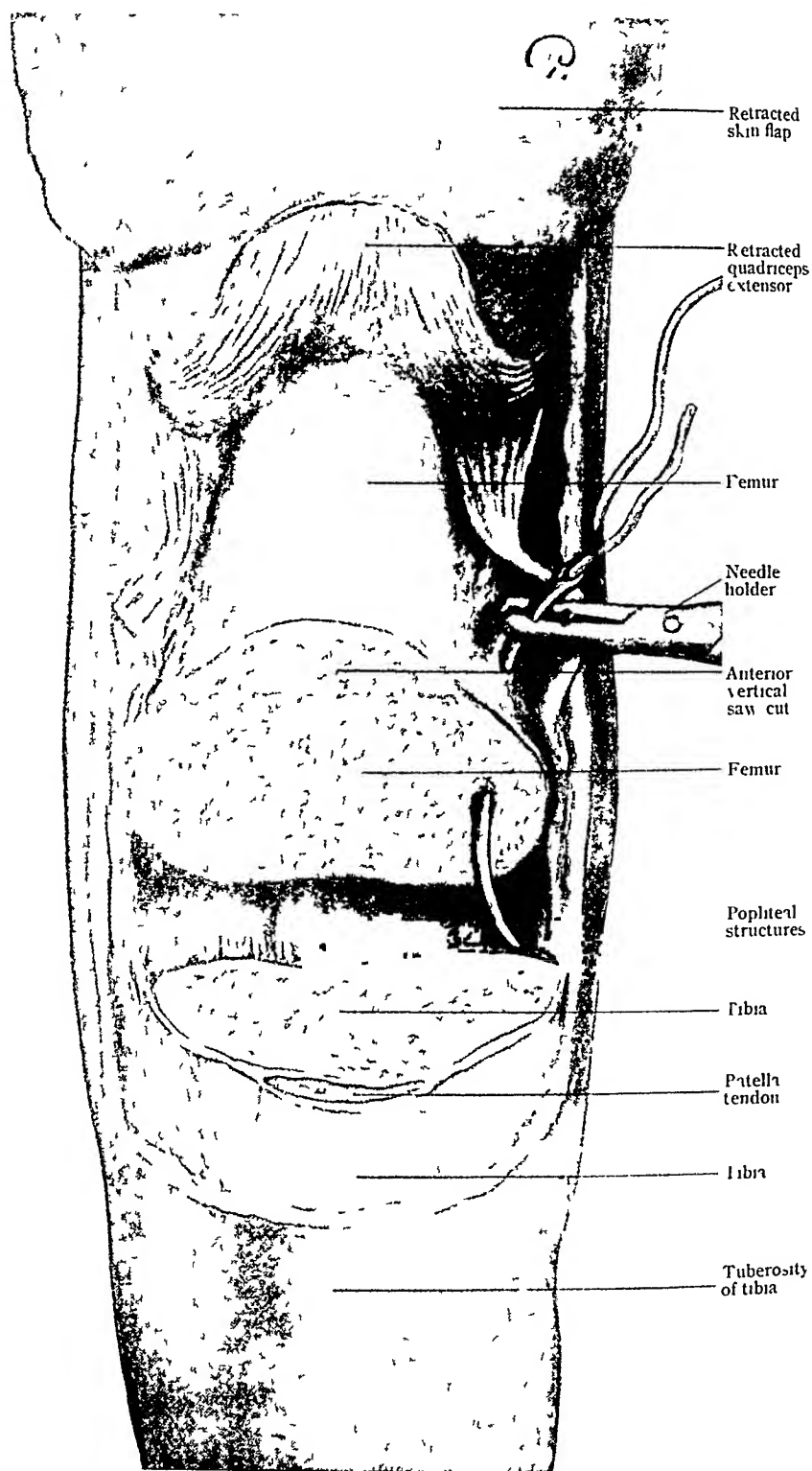


FIG 8—Joint removed—Hagedorn needle passed through femur

tion, otherwise the saw-cut in the femur will be too high up

After withdrawing the saw from the femur the leg is once more placed in a horizontal position. The saw is introduced behind the subcrural bursa at the upper margin of the articular cartilage on the front of the femur and a cut made which will meet the anterior limit of the horizontal saw-cut made from behind (Fig 6). This last cut is almost vertical, in the coronal plane, and allows the articular portion of the femur which extends upward in front to be removed with the joint

This is the last step of the incision proper, for it is now possible to lift out the joint with the patella and subcrural bursa, the articular surfaces of femur and tibia, all complete without having opened the joint (Fig 7). Up to this point a tourniquet is used, but inasmuch as this part of the operation takes but little time, in fact about ten minutes, and in easy cases six minutes, we do not see the disadvantageous effects of longer use such as would be necessary to obtain complete hæmostasis in an operation which opens the joint transversely or dissects off the structures little by little. On removal of the tourniquet the bleeding points can be quickly clamped and tied, thereby reducing hemorrhage to a minimum.

The subsequent steps of the operation differ in no way from those hitherto customary.

The writer unites the bones with No. 4 chromic catgut, six stitches passed directly through the bone with a large curved Hagedorn needle (Fig 9). It is usually unnecessary to bore holes. The cortical portion of the lower part of the femur and upper region of the tibia is so thin that it can readily be penetrated by a needle. The needle goes slowly at first and should be held in the holder about one inch from the point so as not to break. (See Fig 8).

When examination of the cut ends of the bones reveals such an amount of disease left behind as to render curetting inadequate and demand removal of another piece of bone, then we are liable to get into the region where the cortex is so

thick as to make this method of suture impracticable In such a case we are obliged to resort to a drill

After the suture of the bone the muscle and skin flaps are turned down and sutured in place As a rule the amount of retraction in the rectangular skin flap about compensates for the shortening due to resection, so that secondary trimming of the skin is not necessary

While suturing bone and soft parts and during the time the plaster dressing is being applied the leg should be carefully held in proper position by an assistant

There are of course extreme cases either with very little tuberculous disease or with very extensive involvement where this operation would not be feasible

This method of resection has the following advantages

- 1 It is quick
- 2 There is very little danger of contamination of the wound by tuberculous or other infection from the joint
- 3 Hemorrhage can be reduced to a minimum
- 4 The operation is thorough, there being but slight chance of leaving diseased tissue behind, thereby diminishing the probability of recurrence

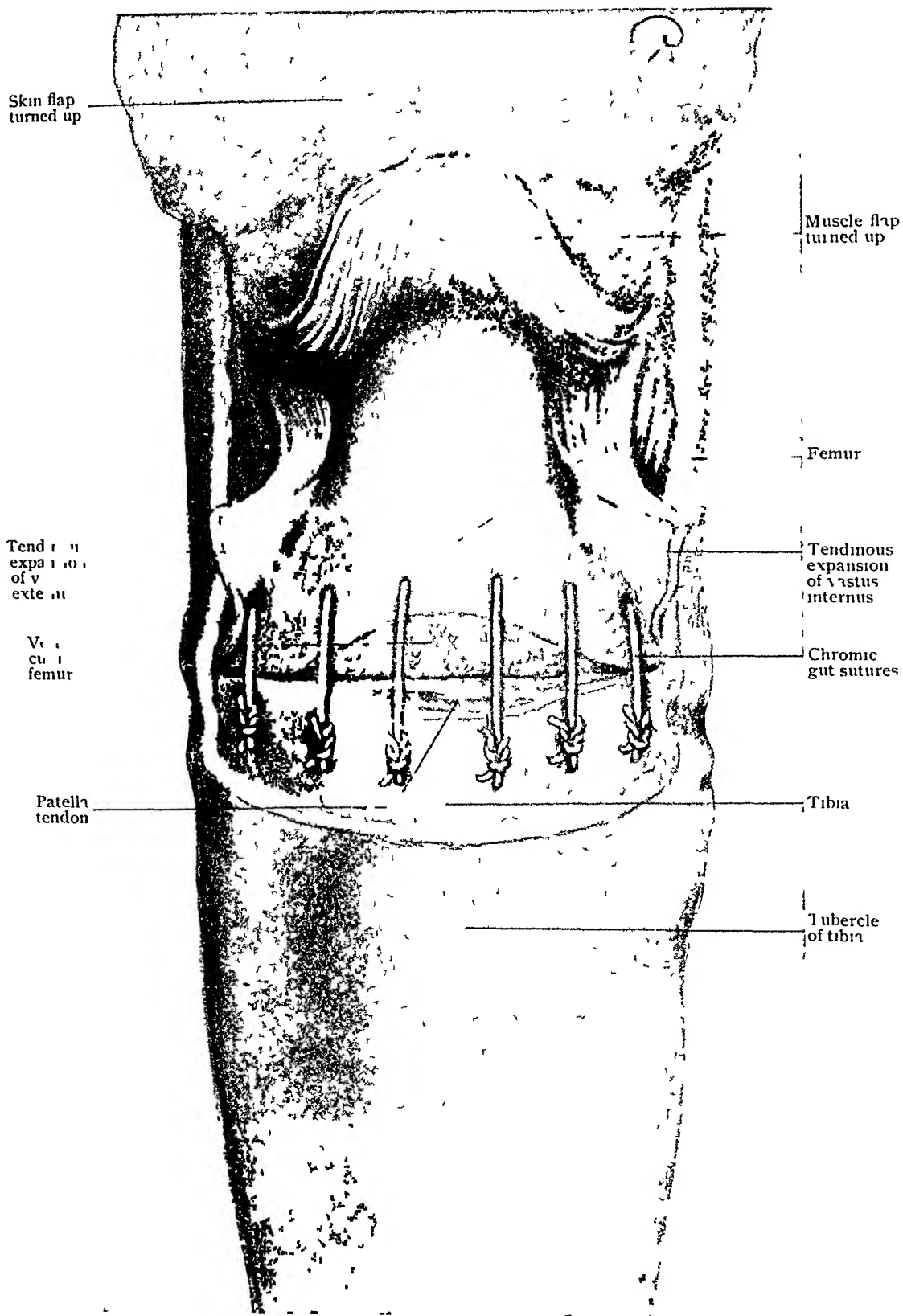


FIG 9—Femur and tibia approximated Sutures in place



# THE EFFECT UPON GLANDULAR TISSUE OF EXPOSURE TO THE X-RAYS <sup>1</sup>

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OF PHILADELPHIA,

Attending Surgeon to St Agnes Hospital, and to the Orthopedic Hospital, Consulting Surgeon to the West Philadelphia Hospital for Women

THE beneficial effects of the X-rays are so enthusiastically proclaimed by the advocates of its therapeutic use in granular swellings and certain of the new growths, that I think a few of its disadvantages should be spoken of by those who see the after effects and who are forced to operate upon tissues that have been long under its influence. My own personal experience is such as to lead me to advise against the employment of the X-rays wherever there is a probability of the case coming to a formal surgical operation. On account of the alteration in appearance and character of the tissues where its use has been prolonged, operations which would ordinarily be simple and easy dissections become formidable and dangerous, as the tissues are thickened and matted together by fibrous material.

This change in the character, both of the surface skin and underlying tissue, is particularly well marked in cases of enlarged cervical glands,—the so-called tubercular adenitis. Ordinarily operations for this condition are easy to perform, the glands readily peel out by blunt dissection, and the blood-vessels and nerves retain their distinct characteristics, thus being plainly recognized and preserved from injury. The physical characteristics of the tissues of the necks which have been subjected to treatment by the X-rays are, however, markedly changed in appearance, the glands become hardened, and may be shrunk if this method of treatment is employed before they have broken down, and while it is true

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<sup>1</sup>Read before the Philadelphia Academy of Surgery, December 4, 1905

that in cases of recent origin many of the swollen glands may entirely disappear, this is not usual. The majority of the glands which the surgeon sees have already broken down and softened in their interior, and the cheesy pus may be simply encapsulated. It is of this variety particularly that I wish to speak.

Most of these cases are of long standing and have been subjected to various plans of treatment by ointment, massage, counter-irritants, etc., before the X-rays are employed. It is only after all the various methods have been tried that the surgeon is requested to operate.

The overlying skin is now found to be thickened, indurated, and much toughened. The glands cannot be peeled out, or pulled away from the blood-vessels and nerves by blunt dissection, but each step must be taken with the greatest deliberation and every particle of tissue that is removed must be separated by cutting with the knife or scissors. The blood-vessels, from the fibrous thickening of their sheath and the surrounding tissues, cannot be easily distinguished, and are only saved from being cut by the utmost vigilance. The dangers, the difficulties, and the time consumed in the operation are thus very materially increased, and my own belief is that the only action of the X-rays in these cases is distinctly harmful.

I have had one case of cystic disease of the left breast in an unmarried woman of 37 where the X-rays were employed, and which subsequently came to operation. The history was that a year before she had discovered a lump in her left breast, but it gave her no discomfort. She consulted a physician, who advised operation, but as her father was very ill and she was nursing him, she refused operative treatment at that time, as she would not leave him. Her family history was bad, as her mother had had cancer of the uterus and her father's illness was supposed to be cancer of the stomach. She elected to try the value of the X-rays and submitted to twenty-eight treatments of ten minutes each. As a result there was an extensive burn of the skin of the

whole breast, the outer layer of the skin peeled off, and this was true also of the areola and nipple I saw her first when this burn was at its worst I could feel that the breast was enlarged and that in the gland there was a swelling, which I took to be, and still believe to have been, a cyst Shortly after this her father died and she then came to me and submitted herself to operation

The skin over the whole of the breast was very dense and hard and in a condition such as I had never seen before It was almost impossible to cut through the skin with a very sharp knife without using extreme force The breast and both pectoral muscles were removed and the axilla cleaned out At this time I could not distinguish definitely a tumor, but the whole breast was thickened and indurated The breast, after its removal, was cut open and macroscopically seemed to be simply a mass of fibrous tissue with few of the characteristics of the normal gland There were one or two small retention cysts She made an absolutely uneventful recovery, but the wound did not heal quite as rapidly as is usual The breast was sent to Dr Longcope, of the Ayer Laboratory, who made this report

The specimen consists of a breast, pectoral muscle and axillary fat Section has been made through the breast It is covered by a piece of skin 1 cm in diameter The center appears yellowish and slightly ulcerated On section the cut surface discloses opaque white breast tissue, which is slightly larger than normal It is fairly well circumscribed and has a more or less pyramidal form The margins are well defined, particularly the lower margin, which is separated from the pectoral muscle by a zone of fat about 1 cm in thickness The breast tissue is quite firm but flabby Scattered through it can be seen bits of fat Here pectoral muscle appears normal The axillary lymph glands are small, soft and pink in color

Sections are made from all parts of the breast They show a coarse net-work of rather dense fibrillated connective tissue enclosing lobules of fat-cells of various sizes The connective tissue contains extremely few cells In many sections the acini are lined by two regular rows of cuboidal epithelium which do not differ essentially from the normal, except that many of the



cells contain large fat droplets Sections through four of the axillary lymph nodes show chronic inflammatory changes There is some hyperplasia of the lymphadenoid tissue with thickening of the reticulum, especially in the lymph sinuses and proliferation of the reticular cells

The lymph sinuses are converted into solid cords The capsule is regular but a little thickened

*Skin*—The epidermis is thickened At one point there is a small area of ulceration Here the corium is covered with a thin layer of fibrin Polymorphonuclear leucocytes and red blood-cells The corium is greatly thickened and the papillary process atrophied It consists of rather dense connective tissue infiltrated in circumscribed foci by cells usually of one type These cells are scattered through the corium, but are most numerous beneath and about the ulcerated surface They are somewhat smaller, irregular, often have a shriveled appearance and the protoplasm stains intensely blue in hæmatoxylin and eosin stains The nuclei are very black and piknotic Sometimes they show a central unstained band which gives the nucleus the appearance of a diplococcus About the ulcerated area there are also many small round cells, a few polymorphonuclear leucocytes and occasional large multinucleated giant-cells

*Diagnosis*—Chronic mastitis with atrophy of mammary gland Chronic inflammation of skin with thickening of corium Chronic inflammation of axillary lymphnodes

Dr Longcope states in a letter which accompanies this report that there was no evidence of malignant growth, but, on the contrary, there was marked atrophy of the glandular tissue with extensive fibrous overgrowth in a diffused manner He considers the thickening of the skin must have been caused by the X-rays, but whether the changes in the breast itself are due to this cause he cannot state positively

In a very carefully written article by Dr A G Ellis, "The Pathology of the Tissue Changes Induced by the X-Ray" (*American Journal of Medical Sciences*, January, 1903), he quotes Huntington as stating that the X-ray burn consists of an acute, subacute, or chronic necrobiosis He

quotes Rudis-Jicinsky as saying that, "The irritation of the peripheral extremities of the sensory nerves causes paralysis of the vasomotor and vascular cells affected. Spasmodic contraction of the arterioles and capillaries follows and the proper nutrition of the cells is impaired. With these changes, which are directly depending upon disturbances of the circulation, there are changes in the parenchyma cells of the affected region. The death of tissue follows, being caused by permanent stasis in the blood-vessels. This is carried out by Codman's statement (Ellis) that the reports of microscopic examinations of the excised tissue agree in stating that similar arterial branches are occluded and the appearances are not unlike those of necrosis and inflammation due to other causes.

Scholtz (Ellis) says that the cell elements under the influence of the X-rays undergo a slow degeneration, chiefly in the epithelial cells, that the nucleus as well as the protoplasm of the cell is affected. This article by Dr. Ellis is so exhaustive and carefully prepared that it should be read by all who are interested in this subject.

In the X-rays we have a very powerful therapeutic agent, whose power for good is undoubtedly very great in inoperable malignant disease of a superficial character and as a prevention of the recurrence of malignant disease after radical operation, but I believe that its use should be confined to this class of cases. I do not believe, in view of the extreme difficulties and complications which are produced by its effects, that it should ever be employed upon the tissues before surgical operation is undertaken.

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, December 13, 1905*

The President, DR GEORGE WOOLSEY, in the Chair

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### EXCISION OF THE TONGUE FOR EPITHELIOMA

DR CLARENCE A McWILLIAMS presented a woman, 24 years old, who was admitted to the Presbyterian Hospital early in August, 1902, complaining of a painful lump on the side of her tongue, which she had first noticed about three months previously. The pain had gradually increased in severity, and extended down the neck. As chewing solids was very painful, she lived chiefly on fluids, and had lost flesh and strength.

Examination showed a hard, superficial lump, about the size of a silver dime, situated on the left side of the tongue. There was no ulceration. The centre of the mass was slightly depressed, and its edges somewhat elevated, with radiations into the adjacent tissues. It did not extend to the dorsum of the tongue, but impinged slightly on the mucous membrane of the mouth, but not as far over as the attachment of the mucous membrane to the lower jaw. The tongue was freely movable. One gland, the size of a marble, could be felt under the angle of the left jaw.

A section removed from the growth was examined microscopically, and showed flat-celled epithelioma, full of epithelial pearls.

A number of sharp, decayed stumps of teeth opposite the mass on the tongue were removed and on August 20, 1902, the patient was operated on by Dr McWilliams. An incision was

made from the middle of the jaw downward to a point just below the cornu of the hyoid bone, and thence up to the angle of the jaw. This flap was dissected up, exposing the enlarged sub-maxillary gland, which extended down to the cornu. The external jugular was ligated and divided, and all enlarged glands in the submaxillary triangle were removed. The lingual artery was ligated, together with its vein. The patient's head was then turned strongly to the right, the right side of the tongue transfixed by a silk thread, and drawn fully out. An incision was made on the dorsum of the tongue, widely encircling the epitheliomatous mass, and extending deep into the muscles of the tongue and over to the attachment of the mucous membrane to the jaw. The knife, passed from below, then divided the attachment of the mucous membrane from the jaw, and the entire mass was removed, together with the enlarged submaxillary and sublingual glands, in one piece. The hemorrhage from the tongue was controlled by means of two clamps. Three gauze drains were introduced from below. The raw edges of the tongue were brought together with catgut, excepting for a distance of about one inch posteriorly. The wound below was closed as far as possible with interrupted silk sutures. An inch and a quarter of the anterior lateral portion of the tongue was removed.

The patient made a satisfactory recovery and as a prophylactic measure submitted to X-ray treatments to the neck for about a year afterwards. Temporary paralysis of the left lower face followed the operation. This has almost but not entirely disappeared. Over three years have now elapsed without sign of a recurrence. The patient's speech is perfect. She has since married, and borne one child.

DR L W HOTCHKISS reported three cases of cancer of the anterior portion of the tongue upon which he had operated during the past two years. In one the patient was now in his second year and showed no signs of a recurrence. In the second, a recurrence had taken place about eighteen months after the operation in the tip of the portion that was left. The third case was that of an old woman with a small epithelioma of the tip of the tongue, in which a wedge-shaped section was removed. In all of the cases, the operation was done through the mouth.

## RESULT OF RESECTION OF ELBOW AND HIP AFTER TEN YEARS

DR McWILLIAMS presented a patient who was admitted to the Presbyterian Hospital in January, 1896. He was 13 years of age. Eight months prior to the time of admission he fell, injuring his right hip, which became swollen. For the past five months he had been confined to bed, and two months prior to his admission the right elbow had become involved with the formation of a sinus. Sinuses had also formed over the left hip. The lungs were healthy.

On January 31, 1896, Dr. Charles K. Briddon resected the elbow, sawing through the ulna just below the coronoid process, and through the neck of the radius at a corresponding point. The humerus was removed nearly to the epiphysis. The arm was put in full extension for two weeks, then in mid-flexion.

Three weeks after the first operation, Dr. Briddon resected the necrosed head of the femur at its junction with the neck, and thoroughly curetted all the sinuses. Buck's extension was then applied to the leg.

The patient improved rapidly, and left the hospital on June 15, 1896. The affected leg was two inches shorter than its fellow, but the motion was good. The function of the right elbow was excellent, with good rotation and flexion to the extent of a right angle.

At the present time flexion and extension of the elbow are perfect, but there is some lateral mobility, which does not impair the usefulness of the arm, which can be used perfectly for all ordinary purposes. His favorite amusement is throwing a baseball. An X-ray photograph shows a posterior displacement of the radius and ulna on the humerus. He is able to walk without the aid of a cane, although there is a shortening of the limb of about two inches. The X-ray photograph shows a displacement of the neck of the femur above the acetabulum.

## PARTIAL GASTRECTOMY FOR CARCINOMA

DR LUCIUS W. HOTCHKISS presented a young man of 23, who was admitted to The Hood Wright Hospital on October 9, 1905, with typical symptoms of carcinoma of stomach, of three months' duration.

Examination showed a fairly well developed, but thin and anæmic man. A tumor, about the size of a large hen's egg, was felt in the epigastric region. It was freely movable, and could be pushed from side to side and up under the ribs. It was hard and nodular, and moved slightly with respiration. It was slightly tender to pressure. On admission, the patient's temperature was 100, pulse, 72, respiration, 20.

Operation, October 20, 1905. Through a median laparotomy wound the abdomen was opened, and a movable mass was found invading the posterior wall and pyloric end of the stomach. There were some enlarged glands in the greater and lesser omentum, and one point of adhesion between the omentum and stomach. There were no adhesions posteriorly. The lesser omentum was ligated and divided close to the liver. The greater omentum was then ligated as high up as the Hartmann-Miculicz line, and the stomach clamped off in such a manner as to include the whole of the lesser and a considerable portion of the greater curvature. The stomach was then divided between the clamps, and the diseased portion, including the pylorus, about one-third of the stomach walls and about an inch and a half of the first portion of the duodenum were removed. The cut ends of the stomach and duodenum were inverted by suture in the usual manner, and an anterior gastroenterostomy was made by suture between the lower part of the anterior wall of the remaining section of the stomach and the jejunum.

After the operation, the patient was nourished entirely by enemata for three days, and then, as there was no vomiting after the second day, small sips of water, hot clam-broth and peptonized milk were allowed at frequent intervals. On the ninth day the nutrient enemata were discontinued, and soft-boiled eggs were added to the dietary, and, a few days later, chopped meat, bread and soft diet. Barring partial failure of the external wound to unite, probably on account of the patient's anæmic condition, the convalescence was afebrile and without any drawbacks, and he was discharged from the hospital on November 21, 1905. At that time he was able to eat ordinary food and to digest it well.

Examination of the specimen removed showed a large growth projecting from the mucous membrane of the stomach,

involving the anterior and posterior walls and both curvatures of the stomach, and beginning to obstruct the pylorus. In its gross appearance it resembled a cauliflower-like growth projecting into the cavity of the stomach from its posterior wall, and infiltrating the gastric wall far beyond the limits of the projecting mass itself, which measured, roughly  $3\frac{1}{4} \times 4 \times 4\frac{1}{8}$  inches. The pathologist reported the growth to be a carcinoma.

The patient had gained about fifteen pounds since he left the hospital, and his general health was much improved.

#### ACUTE TETANUS TREATED BY INTRASPINAL INJECTIONS OF MAGNESIUM SULPHATE

DR JOSEPH A. BLAKE presented a boy fifteen years of age, who was admitted to the Roosevelt Hospital on November 3, 1905, with the following history. Nine days before admission he had crushed off the ends of the first three fingers of the left hand. Two days before admission he commenced to have stiffness of the jaw and neck, and could not fully open his mouth. He also complained of pain in the back of the neck. The initial symptoms consequently developed seven days after the injury.

On the day of admission, the jaws could be separated for three-quarters of an inch, the sterno-mastoids were prominent and in spasms, flexion and extension of the neck were not painful, lateral motion was painful and limited. The following day there was little increase in the symptoms. That morning, Dr. Walton Martin, under nitrous-oxide-ether anæsthesia, dressed the fingers by curetting them, cutting off necrotic fragments of tissue and swabbing them with tincture of iodine. At the same time he injected into the spinal cord (introducing the needle between the fourth and fifth cervical vertebræ) forty cubic centimeters of antitoxin, and an additional twenty cubic centimeters into the median cephalic vein. That night the temperature rose to  $102^{\circ}$ , there was increased stiffness of the neck and jaw, and commencing spasms of the vertebral muscles. The day following the operation and injection the rigidity had increased, there were commencing spasms of the muscles of the lower extremities, and opisthotonus. That afternoon thirty-five cubic centimeters of antitoxin were injected into the spinal canal.

by lumbar puncture The same night the patient's temperature reached  $104.4^{\circ}$  On the second day following the first injection there was marked opisthotonus, but the contraction of the masseters had not increased The temperature during this day was high, between  $103^{\circ}$  and  $104^{\circ}$ , the pulse between 104 and 112, and the patient was evidently feeling the strain of the almost constant convulsions and severe pain In twenty-four hours, 24 minims of Magendie's Solution had been required His condition being very grave, it was decided to try the effects of the intraspinal injection of magnesium sulphate in controlling the convulsions, accordingly four and one-half cubic centimeters of a solution of magnesium sulphate, 25 parts in 100 parts of water, were injected by lumbar puncture, this being approximately the amount recommended by Dr S J Meltzer for the production of anæsthesia

Two and three-quarter hours after the injection the patient was stuporous, the spasm of the neck was lessened, the opisthotonus was gone, there was no effect from irritation of the trunk or extremities, but pricking of the face produced response Six hours after the injection the mouth could be opened wide, the stiffness of the neck and back had disappeared, sensation was present in the face, trunk and legs, the arms and legs could be moved slightly, there was no pain, and the temperature had fallen to  $102.6^{\circ}$ , the pulse to 104, the respirations were 14 The patient seemed drowsy, but took nourishment well Nine hours after the injection, the temperature rose to  $104^{\circ}$ , but responded to an alcohol sponge, and fell during the next twenty-four hours to  $101^{\circ}$

During this time the convulsions were in abeyance, the jaw was relaxed, but at the end of the day following the day of the injection, there was increasing pain and stiffness of the neck and back muscles, and at 9 P M on November 7, thirty-three hours after the first injection, opisthotonus had returned The same amount of magnesium sulphate was again injected into the spine, and was followed by the same improvement as was noticed after the first injection although it was followed by a rise in temperature to  $103.4^{\circ}$ .

The injection did not have to be repeated until November 9, at 10 30 A M, an interval of thirty-seven and one-half hours



having elapsed The opisthotonus and pain had then returned At this injection, by advice of Dr Meltzer, eight cubic centimeters of a 12.5% solution were used The same good effects were noticed after this injection, excepting that the relief did not seem quite so marked as after the injection of the stronger solution On November 10, twenty-nine hours afterward, the pain and opisthotonus having returned, a fourth injection was given, eight cubic centimeters of the 12.5% solution being used, the same as in the third injection This was followed by a similar relief of the symptoms, and although there was a return of the stiffness of the neck and back muscles, and some pain, he was kept comfortable with morphine and chloral His temperature reached normal on the thirteenth day of his disease, the seventh after the first injection of magnesium sulphate On the sixteenth day of the disease, the convulsions, which during the preceding days had resembled those of a case of chronic tetanus, became much more pronounced and violent, and a fifth injection of eight cubic centimeters of the 12.5% solution was given The relief after this injection persisted, and he gradually improved and was practically well by December 1 During his illness, the wound was dressed daily with weak iodine water

Dr Blake said that the following conclusions might be derived from this case That repeated intraspinal injections of magnesium sulphate may be safely given, that they have a marked effect in restraining the convulsions and relieving pain, probably by inhibition of both afferent and efferent impulses, that the restraint of the convulsions diminishes metabolism and heat production, that, probably, the spasm of the muscles of mastication is diminished, although that was not proven by this case, since the jaw was not closed at any time, that in this case the period of control of the convulsions was about thirty-six hours (twenty-nine to thirty-seven and one-half) but that this period, judging from the effects of magnesium sulphate in other cases, will probably differ in different individuals

Of course, there was nothing specific in the action of magnesium sulphate in tetanus Its exhibition was symptomatic If its effects would prove as beneficial in other cases as they had in this, it would at least be of great value in controlling the convulsions and preventing exhaustion It is difficult to say how

much benefit had been derived in this case from the injections of the antitoxin

DR ROBERT H M DAWBARN mentioned a case of acute tetanus treated by him at the City Hospital by means of intra-spinal injections of the Board of Health antitetanic serum in large doses. This case ended fatally, and shortly afterwards, the speaker said, he met Dr Richard Kalish, President of the Hospital Board of Physicians, who stated that many years ago, while serving as an interne at Bellevue Hospital, eight cases of lockjaw came under his care. The first five of these cases were treated in the usual way, with bromides and chloral in large amounts, and all ended fatally. The three remaining cases, which were equally severe, were given very large hypodermic injections of the fluid extract of *physostigma venenosum*, and all three recovered.

Dr Dawbarn added that it seemed to him a better plan, if we wished to test this claim, to inject an alkaloidal salt of physostigmine (eserine), say the salicylate, which is officinal, instead of using the fluid extract of the crude drug, for in this way we avoid introducing calabarine too—which is the spinal-excitant principle, resembling strychnine in effect, less in amount than physostigmine, in the drug, but always present.

Dr Dawbarn said the objection that might be raised to the use of chloral in tetanus on the ground that it weakened the heart action did not apply to physostigmine. Those two remedies should not be classed together. The latter drug possessed the peculiar quality of increasing the force of the heart's action, and at the same time diminishing its frequency, even though all the nerves of the heart be cut (quoting H C Wood's "Materia Medica"). The only reason that with its desirable properties physostigmine is not used as a heart tonic is its motor depressant action upon the spinal cord, which is the cause of its employment by Dr Kalish in the cases quoted. Dr Dawbarn added that Dr Kalish agreed that he should as a duty have reported these instances without delay, and had authorized the speaker to do so now.

DR ALEXANDER B JOHNSON said that a few days ago he saw a case of acute tetanus in which the intra-spinal injections of magnesium sulphate were of no avail.

DR SAMUEL J MELTZER said the case reported by Dr Blake furnished corroborative evidence of a number of facts. One was, that repeated intraspinal injections of magnesium sulphate had produced no injurious after-effects, another was that the injection of the salt was immediately followed by a relaxation of the tonic and clonic contractions of the muscles, and furthermore, that the opisthotonus and trismus and contraction of the facial muscles were at once relieved. This showed that the effects of the drug extended as high up as the origin of the cerebral and cervical nerves. These same results of the intraspinal injections of magnesium sulphate he had observed in a more extensive and reliable way in animals, especially in monkeys. Repeated experiments in monkeys had shown that the most severe forms of opisthotonus and trismus could be relieved in a very short time. The effects of the drug were first observed in the lower extremities, and then spread over the entire body.

#### RECURRENT VOLVULUS OF THE SIGMOID FLEXURE

DR JOSEPH A BLAKE presented a man, 63 years old, who was admitted to the Roosevelt Hospital, the first time, on December 31, 1902, with a history of chronic constipation of an extreme type for the previous five years, and complete obstruction, with fecal vomiting, of five days' duration. Operation revealed a volvulus of 360°, of the sigmoid flexure. The loop was enormously distended, but not gangrenous, and on lifting it from the abdomen, it had to be incised to prevent its bursting. After it had been emptied, it was sutured to the abdominal wall through a second intermuscular incision in the left iliac region. Immediate convalescence was uneventful, but he returned to the hospital seven weeks later with an abscess in the lateral wound where the gut had been sutured. This was evacuated, and a few days later he developed all the symptoms of acute intestinal obstruction. A diagnosis of obstruction at the point of suture of the gut to the abdominal wall was made, and the gut was opened at this point through the incision made for evacuation of the abscess. This gave him immediate relief, and in a few days, normal evacuations, per anum, were reestablished, and the colostomy wound closed of itself.

The patient was next seen a year later, when he returned to the hospital on January 13, 1904, with another attack of volvulus. Median cœliotomy was again performed, and a condition exactly like that present at the first operation was found. There was absolutely no sign of adhesion of the sigmoid to the abdominal wall, to which it had been sutured at the first operation, and no evidence of the colostomy. The gut wall, however, was markedly thickened, and showed numerous striæ of adventitious connective tissue. The loop, which was much distended, was untwisted and emptied through a rectal tube introduced per anum. He left the hospital in good health a month later.

On November 14 last he again returned to the hospital with the same symptoms of obstruction, this time of three days' duration. His condition was good, although the vomitus had been feculent for twenty-four hours. Immediate cœliotomy was performed, the incision being made just to the left of the old median scar. The incision was carried very carefully down through the old scar tissue for fear of injuring adherent intestine, but with all this precaution, a loop of the ileum which had become imbedded in the scar was incised. Attention was first attracted to it by its persistent bleeding. It now became necessary to separate the gut in order to repair it, which proved to be an almost hopeless task, inasmuch as a large area of adhesive peritonitis had formed, gluing loops of small intestine together and to the abdominal wall in an almost inextricable mass. It required an hour of careful and patient dissection to separate these, and by this time the wounded loop was so injured as to demand a resection of about six inches. This was done, and an end-to-end suture made.

The volvulus of the sigmoid flexure was then uncovered, and found to be twisted through two complete turns, the loop having insinuated itself through an opening between the adherent coils of small intestine. It was reduced, and the distended loop emptied with a rectal tube per anum as in the previous operation. The gut showed still more thickening, and its mesentery was dense and much narrowed.

The patient's recovery was uninterrupted save for a stitch abscess. The only permanent cure for this case would be excision of the entire sigmoid flexure. One would hesitate to do

this during an attack, and the age of the patient would hardly warrant it as an interval procedure. Moynihan excised the sigmoid flexure in a case of volvulus that had recurred a second time.

This patient has had three attacks of volvulus, and one attack of ileus, due probably to a kink from a misdirected attempt to anchor the loop.

### TYPHOID PERFORATION OF THE ILEUM

DR WOOLSEY reported the history of a boy of 17, who was admitted to the medical division of the Presbyterian Hospital on May 29, 1905, with typhoid fever. He ran an irregular temperature for eight days, then it fell to normal and remained so for nineteen days. The Widal test at that time was negative. On the thirty-first day after his admission to the hospital there was apparently a relapse of his typhoid fever, with a temperature as high as 104, and new rose spots. The Widal reaction was still negative. The leucocytosis was 6,500.

On the thirty-fourth day of his relapse (June 28), the temperature was irregular, with a downward trend. On that day the patient first complained of pain in the right lower quadrant of the abdomen, radiating into the scrotum and penis. There was marked tenderness on both sides, especially below the umbilicus. The recti were markedly rigid. Liver dulness was normal. Five hours later the temperature had risen from 101 to 105, with a pulse of 118, respirations, 28. The leucocyte count was 7,700. There was no vomiting. Abdominal respiration was restricted, and absent in the lower half. The abdomen was universally tender, and there was rigidity below the umbilicus. There was slightly shifting dulness in the flanks, no fluid wave.

Six hours after the first symptoms of perforation, an incision was made through the right rectus. The peritoneal cavity contained a considerable amount of free greenish fluid, of foul odor, but no gas. A perforation of the gut, about one-quarter of an inch in diameter, was discovered about fifteen inches from the ileocecal valve. A purse-string suture was applied, but on drawing it tight it cut through, and was thereupon replaced by two rows of silk Lembert sutures. The peritoneal cavity was

then irrigated with saline solution, and a large, rubber drainage-tube with gauze core was inserted into the pelvis

The patient made a good recovery from the operation, and his temperature had dropped to 99 the next morning. It remained low until the fifth day, when it rose to 103. From that point it gradually fell, and never went above 102. The drainage-tube was removed on the third day, and the sutures three days later.

Subsequently, the edges of the wound separated, and were brought together by strapping.

A curious feature in connection with the case was that the temperature of the relapse persisted for 60 days, but during its course declined as if at the close of the relapse and then rose suddenly and continued higher, indicating, apparently, a double relapse. After recovering from his second relapse, the temperature remained normal for nine days, then again became elevated, accompanied by new rose spots, a palpable spleen, etc. It finally dropped to normal on the one hundred and seventh day of the disease, and remained so, and the patient left the hospital, cured, on the one hundred and forty-sixth day.

Dr Woolsey said that this was the third case of typhoid perforation that he had operated on last summer, and it was the only one that had recovered. In one of the fatal cases the perforation was in the ileum, and the operation was done too late. In the other case, there were no perforations in the ileum but two perforations of the sigmoid flexure. A large area of the sigmoid was in a semi-necrotic condition.

#### METALLIC FOREIGN BODIES IN A BRONCHUS

DR GEORGE R. FOWLER read a paper with the above title.

DR B. FARQUHAR CURTIS had recently operated upon a boy, ten years old, who inhaled the metal cap of a pencil, which was located in the left bronchus. The symptoms were almost the exact counterpart of those in one of the cases recounted by Dr Fowler. The obstruction produced complete loss of respiration on the affected side, excepting in the upper lobe. There was a slight cough, and the patient's temperature gradually rose to 101. A low tracheotomy was performed, a curved uterine forceps was introduced through the wound, and the foreign body was

easily found and removed. The boy made an uneventful recovery, in spite of the fact that the withdrawal of the pencil cap was followed by several drams of pure pus.

Dr. Curtis was inclined to believe that an ineffectual search for a foreign body through the tracheotomy wound should not be persisted in for longer than half an hour. If, at the end of that time, the patient's condition warranted it, he should be immediately turned over and the chest opened from the back. Some years ago he had published (*ANNALS OF SURGERY*, 1898,) the case of a boy who had inspired a dried berry with a pin thrust through it. The X-rays failed to throw any light upon the position of the foreign body, but the physical signs showed that it was in the right bronchus. It was located through a deep tracheotomy wound, and efforts were made to grasp it, but these proved unsuccessful, and were abandoned after three-quarters of an hour. At this time, three days after the accident, symptoms of pneumonia were already present. The following day the chest was opened from the back, but owing to the lack of proper instruments to retract the lung, the foreign body could not be reached. After waiting another twenty-four hours to allow pleural adhesions to form, the bronchus was reached and opened but the foreign body could not be extracted owing to its softened state. The patient died two days later of pneumonia.

His experience with this case had convinced him on two points. First, That attempts to remove a foreign body in the bronchus through a tracheotomy wound should not be too prolonged, and, second, one should not wait until the next day to open the chest from behind, but should proceed immediately with that operation.

Dr. McWilliams reported a case recently seen by him at the Presbyterian Hospital, in which the value of the bronchoscope was well illustrated. The patient was a child of five years that two days prior to its admission to the hospital had inspired a bean. An examination of the chest revealed dulness and diminished breathing on the right side, with many râles. The X-ray showed nothing. The following day the physical signs indicated a general bronchitis, with an increased area of dulness and a loss of breathing sounds. The case was regarded as one of foreign

body in the bronchus Dr Emil Mayer saw the patient and introduced his bronchoscope through a low tracheotomy wound, and readily located the bean at the bifurcation of the right bronchus. Then, with another instrument, he grasped the bean, but it was so brittle that it broke, and had to be removed piecemeal. The child died on the following day of pneumonia. The speaker called attention to the fact that it required considerable dexterity to use the bronchoscope, although no more skill is necessary than in the use of the cystoscope or endoscope. The bronchoscope promises to solve all the difficulties attendant upon the extraction of foreign bodies of all kinds from the bronchi.

DR OTTO G T KILIANI mentioned a case that he had reported at a meeting of the Society about a year ago. The patient, a boy, was holding a silver horse-shoe pin between his teeth. His room-mate, in order to get possession of it, grasped the boy's nose, and the pin was suddenly inspired into his larynx. The boy at once came to New York, and a tracheotomy was done, and the pin was coughed up through the wound. It had given rise to no symptoms, and had been located in the left bronchus. The patient made a rapid recovery. In another case that he saw, the foreign body was a military uniform button, which was removed from the left bronchus through a tracheotomy wound by means of a forceps.

In both of these cases, Dr Kiliani said the bronchoscope was tried, but it was exceedingly difficult to do anything with it. Its use required a good deal of practice.

DR CHARLES H PECK mentioned a case of a pin in the left bronchus which was operated on by Dr Robert F Weir. The patient was a child, two years old. The pin, which was located with the X-rays, had a spherical, gold-plated head, which rested on the secondary bifurcation of the left bronchus. A low tracheotomy was done, and the pin was removed after one or two trials with a slender pair of forceps.

DR GEORGE D STEWART said his assistant had made some experiments by introducing shot into the trachea and subsequently locating them with the X-ray, and he had found that the right bronchus, instead of being more horizontal than the left, was more vertical which furnished another reason why foreign bodies more frequently found their way into the right tube.



He reported a case that came under his observation, in which a lima bean had been inspired and had lodged in the right bronchus. A low tracheotomy was done, and an attempt made to grasp the bean, but the instrument used was so large that the patient ceased to breathe. A flexible rubber catheter was introduced, passing the bean and entering the left bronchus. During further manipulation oxygen was administered. A smaller forceps was introduced beside the catheter and the bean was extracted. The patient recovered.

Another case was that of a small boy, who, while sucking some candy that contained a whole almond, had a violent paroxysm of coughing, and the candy suddenly disappeared. The family physician was sent for, who thought the candy had been expelled. The paroxysms of coughing, however, persisted for several days, and the boy was then brought to the hospital. One of the physicians connected with the hospital examined the chest and found evidences of bronchitis, but believed there was no obstruction of the bronchus. To Dr. Stewart it appeared, however, that there was lessening of the volume of air inspired into the right lung particularly over its upper lobe. The X-ray showed nothing. An examination of the chest was apparently negative. As the boy's temperature was gradually going up, a low tracheotomy was done, and an almond, an inch and a quarter long, was removed from the right bronchus. Its larger end pointed downward, while its smaller end protruded into the trachea. Some pus followed the extraction of the nut, and the boy eventually made a good recovery.

DR. FOWLER, in closing, said that thus far he had never had a case in which he considered posterior thoracoplasty justifiable, and in the light of the experience of others he was inclined to regard posterior thoracoplasty as the most difficult and probably the most impracticable operation in surgery. In desperate cases it might be justifiable, but it should not be offered with much hope of success.

The bronchoscope introduced by Kiliani some years ago, was simply a urethroscope on a little larger scale. The foreign body could not be extracted with the bronchoscope, it would simply help in guiding the forceps, and large foreign bodies would not pass through the lumen of the instrument. Further-

more, as had already been pointed out, it was exceedingly difficult to manipulate it without much practice

### A LEAD PENCIL REMOVED FROM THE CÆCUM

DR GEORGE D STEWART showed this specimen The patient from whom it had been removed was a longshoreman, 31 years old, who came to St Vincent's Hospital with the history that for the past two years he had had repeated attacks of pain in the right iliac region, with occasional vomiting These attacks lasted for two or three days, sometimes a week, and compelled him to give up his work

Examination of the abdomen revealed a small, rather hard and sensitive tumor in the right iliac region directly under McBurney's point The case was regarded as one of appendicitis, and when the abdomen was opened, four days ago an inflammatory mass was found with dense adhesions to the anterior abdominal wall Upon inserting the finger, Dr Stewart felt what he supposed was a hard concretion in the appendix It continued upward, however, and was finally lost behind the liver He then concluded that he had to deal with a foreign body This body he succeeded in getting down into the lumen of the appendix, and upon cutting off that organ, he was able to grasp and remove the foreign body, which proved to be an ordinary lead-pencil, a little over seven and a-half inches long The blunt end of the pencil had been directed downward, the point upward behind the liver, and it had apparently occupied the entire length of the cæcum and ascending colon

Upon questioning the man after the operation, he first asserted that he had swallowed the pencil twelve years ago, but as this was not credited on account of the anatomical difficulties a foreign body of this length would have to overcome before reaching the cæcum, he finally admitted that two years ago, while suffering from constipation, he had inserted the pencil into the rectum and it had slipped from his fingers and out of his reach He then went to a hospital, where he was examined under ether, but no trace of the pencil was discovered An attempt was also made to locate the foreign body by means of the X-rays, but failed

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, December 4, 1905*

The President, HENRY R WHARTON, M D , in the Chair

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### THE OPERATIVE RESULTS IN AN OLD FRACTURE OF THE PATELLA

DR EDWARD MARTIN presented a man who in May, 1905, had by a direct fall upon the patella fractured that bone, the fracture probably being comminuted. Two months later he came to the hospital with his knee-joint absolutely stiff and very painful, the patella being firmly fixed by adhesion to the anterior surface of the lower articulating end of the femur, and also to the skin. Operation was performed in the usual way by turning a broad flap from above downward. The upper fragment was firmly adherent to the femur by tissue that was almost bony in character. After the removal of several small splinters, the bone and capsule were sutured in the ordinary manner, the patella with silver wire passed through drill-holes. The patient did well and at the end of three weeks went home with a freely movable patella and a painless smooth flexion of  $45^{\circ}$ . A few weeks ago he returned because motion in the knee was not sufficient to allow him to go upstairs readily or to stoop, positions required in his work. Examination showed that the joint appeared to lock and on forced flexion pain was felt on the outer side of the articulation. The patella was firmly united by bony union. Reopening the joint was considered, but under moderate anæsthesia flexion was carried to beyond a right angle. Two days later the joint was again bent,

under ether, and the patella refractured Dr Martin now intends to allow the man to go home with a slight separation of the fragments (maximum in flexion  $\frac{1}{4}$  in ) as this may give him a more useful knee, he has been allowed to walk about since the fracture The case illustrates that it is not necessary to transplant a soft flap between a patella which has grown to the femur and the surface of the latter bone after loosening their adhesion as the same result can be secured by passive movement of the bone It also suggests that some of the good results reported from the use of such flaps may have been due to passive motion after operation He also believed that a longer period of delay after operation before forcibly breaking up adhesions would have been desirable

#### EXTENSIVE ANGIOMA OF THE FACE

DR MARTIN presented a boy of 12, who had been under treatment for eleven months The angioma, which was noticed the second day after birth, involves the entire upper lip and extends well toward the left eye It is adherent to the skin, the vessels of which are also affected, and extends into the mouth as far as the soft palate Plastic operation seems out of the question, as any radical surgical proceeding could not help leaving an enormous scar and excessive disfigurement Galvanopuncture was employed every second or third day for several weeks, the needle being inserted about the periphery of the mass but from this no distinct benefit was derived The injection of absolute alcohol, 20 minims once a week, was then begun and has been carried out for some months This procedure is followed by inflammation and contracture and is undoubtedly causing improvement Dr Martin is now contemplating the use of subcutaneous ligature or of causing a greater degree of inflammation by inserting sterilized catgut The latter may be accomplished by passing a large hollow needle through the plexus of veins, having a piece of catgut through the lumen of the needle, withdrawing the needle, leaving the catgut in its place, and cutting both ends of the gut close to the skin This should encourage the formation and subsequent organization of an extensive exudate

DR JOHN B ROBERTS mentioned a case of angioma of the lip, in a child of three, recently under the care of Dr J P Hutch-

inson at the Methodist Hospital A good deal was gained in that case by subcutaneous ligature, and now Dr Roberts is injecting with success boiling water after the manner of Wyeth A year ago he operated on an infant with a large angioma of the brow which had been subjected to almost all the disfiguring operations resorted to in these cases, without permanent benefit It was cured by the use of Wyeth's method There seemed to be but little irritation caused by the injection, though five or six punctures were made at each sitting The method is a very valuable one

DR RICHARD H HARTE spoke of a case which some years ago was under the care of Dr Hodge in the Presbyterian Hospital It was similar to the case shown by Dr Martin, except the growth did not extend so far toward the nares Dr Hodge succeeded in applying a ligature and this was followed by satisfactory results Regarding the Wyeth method of using hot water, Dr Harte had one case of angioma involving the hand and forearm in which he employed the injections extensively His experience is that a great deal of care and caution must be exercised in its use In many cases if water be used indiscriminately, disastrous results will follow In angiomas injection does cause an inflammatory thickening and the mass shrivels and disappears Dr Harte finds that a great deal of reaction follows the injections, at one time he was quite alarmed by the after symptoms in his case

#### URINARY INFILTRATION, ACUTE SEPSIS, RECOVERY AFTER PERINEAL SECTION

DR DE FOREST WILLARD reported the history of a mulatto, 24 years of age, who was admitted to the Presbyterian Hospital December 1, 1905, with a temperature of 104.2 He gave a history of gonorrhea six years previously with intervals of urethral discharge since that time He had had no previous retention of urine, no ardor urinæ, except occasionally when the stream would be interfered with An advertising doctor whom he visited in New York (according to his account) divided his meatus and apparently did an internal urethrotomy with an intensely infected instrument He returned to Philadelphia the same even-

ing and drove about the city as coachman the following day, bleeding somewhat from the urethra. In the evening he had a considerable hemorrhage. On admission he was bleeding slowly from the urethra and the following day there was so much oozing that no instrument was passed. His perineum was bulging but was not hard, but was moderately tender. The following night he had two chills, after which his temperature rose to 108.4, pulse 176. The temperature was taken by the mouth by a careful nurse, and was verified a half hour later by the head nurse, when it was still 107.8, leucocytes 17,000 to 24,000, urine, blood tinged, bowels moved involuntarily in bed. Abundant staphylococci only in blood.

Dr. Hodge then made a median perineal section. An English catheter was inserted into the bladder and on a grooved director the urethra was split back to the prostate only. The catheter was left in the bladder and connected by a tube to a urinal. The hemorrhage was considerable but was controlled by packing. No pus was found, but the oozing of the septic products and toxins was free and the effect upon the temperature and pulse was speedily evident and improvement was rapid. He was discharged from the hospital in twenty days with an opening still in the perineum. Steel sounds to be passed at regular intervals to insure the formation of the proper sized urethra.

A peculiar part of the history is the insistence by the patient that the operation from which he so narrowly escaped death was performed, not for stricture, but for the cure of seminal emissions.

The reporter said that he had never before, save in sunstroke, had a recovery when the temperature reached 108.4.

DR. WILLIAM J. TAYLOR said the man operated upon by Dr. Willard was in his employ. The urethrotomy was done on Tuesday afternoon and the man came to his work on Wednesday morning apparently perfectly well. He drove until 2 o'clock but was taken with a chill and fever in the afternoon. In the evening he became ill and was seen by Dr. Steele, who lived near his home, and sent to the hospital. Now a 28 French sound can be passed. The perineal wound is not yet skinned over but the man seems perfectly well and attends to his driving as usual.

## BRADYCARDIA FOLLOWING HEAD INJURY

DR DE FOREST WILLARD reported the history of a man, 64 years of age, who was in good health until ten days previous to observation, when he had an attack of vertigo lasting but a few minutes, with no spasmodic symptoms. He was admitted to the Presbyterian Hospital November 21, 1905, with a slight scalp wound in the back of the head, reported to have been occasioned either by a brick having fallen upon him, or as believed by a fellow workman to have been occasioned by vertigo which had caused him to fall about four feet. Patient walked to the hospital, but while being dressed had a slight convulsion in which the face became cyanotic and was followed by snoring sleep of several hours but from which he could be easily aroused. Was dazed and slightly delirious for several days. There were no evidences of fracture, no paralysis, pupils slightly unequal for two days, afterward of same size. He lay most of the time with his eyes closed, quietly sleeping, but could be easily aroused and answered questions intelligently.

On entrance his pulse was 56, but fell steadily without diminution in volume until on the second day it reached 28, the fourth day 25, the seventh day 23, has continued in the twenties up to the present time,—*i e*, ten days. Respirations varying from 12 to 20, temperature 97. His arteries are very atheromatous, but he presents no evidence of valvular disease of the heart, although the muscle is weak. Heart sounds agree with pulse at wrist. Urine from 30 to 90 ounces daily. At first slight trace of albumen with a few casts, later, negative. Leucocytes 8000, hemoglobin 98%, red blood corpuscles 4,900,000.

The cause of this inhibition of heart action is difficult to explain and the point of interference with the pneumogastric or sympathetic is uncertain. He eats and sleeps well and appears to suffer no special inconvenience. Has no loss of motor or sensory power. As he had not been attended by any physician it is not known whether he had ever shown this slow pulse on previous occasions. Dr Willard had never, save in opium poisoning, seen so slow a continuous pulse.

## ASEPTIC FOREIGN BODY LEFT WITHIN THE CRANIAL CAVITY

DR JOHN B ROBERTS reported the following case because of the unusual position in which a piece of sterile gauze was left after operation for trephining the skull

A man was admitted to the Methodist Hospital on November 7, 1905, with a sinus above the right ear which was discharging a small amount of pus. He complained of severe headache, in the same region, and general convulsions accompanied by unconsciousness.

The history which he gave was to the effect that on July 1, 1905, he fell from the third story of a building, sustaining an injury to the head, for which he was subjected, in a hospital, to operation upon the skull. He was discharged cured in a month and returned to work. At this time he felt fairly well, although he complained of mild headache, progressive loss of hearing in the left ear and diminution of sight in the right eye. Two and a half months after the time of the original injury, he was struck upon the head in the region of the scar and promptly thereafter suffered an increase in the severity of the headache. In the course of a few days there was a discharge of a considerable amount of pus from a swelling at the region affected. The discharge of pus continued through the sinus left and was present when he came to the hospital for treatment. A week before his admission he had sharp pain at the site of the old scar, clinching of the hands and jaws and unconsciousness.

Examination upon admission showed a semilunar scar over the right ear and a sinus near the ear at the end of the former incision. There appeared also to be a slight discharge from the ear itself. The heart, lungs, liver and spleen showed on examination nothing abnormal. The reflexes were normal and the sensation unimpaired. Careful examination of the eyes and ears was not made at the time, because the patient's convulsions became so marked that Dr. Roberts proceeded to operation a day or two after his admission. The pain in the head and the convulsions were so severe, and the latter so frequent, that it seemed important to open up the sinus and search for a brain abscess rather than wait for extended study of the case. The region



affected was incised and developed evidence of a former trephining, and a sinus running into the cranial cavity. The opening, which was in the squamous portion of the temporal bone, was closed with thick fibrous tissue. A few drops of pus exuded from the fistulous tract, but no abscess cavity was found. There came to view, however, underneath the dura at the upper part of the trephine opening a piece of gauze, such as is used for packing wounds, firmly attached to, and interlaced with, the fibrous tissue. In order to withdraw this foreign body, it was necessary to cut out the mass of fibrous tissue which closed the opening in the skull and then cut away a portion of the bone at the upper edge of the opening. The original opening had been about  $1\frac{1}{2}$  inches in diameter anteroposteriorly and three-quarters of an inch vertically. Careful exploration was made to see that no portions of gauze were left.

The wound was thoroughly cleansed and closed partially, but in a manner not to interfere with drainage. The dura, of course, could not be closed and it was necessary to provide drainage, because of the existence of pus before the operation was begun.

The plug of gauze removed was about the size of a hazelnut. It seems probable that at the time of the original operation, done by a surgeon in some other hospital, bleeding occurred and a piece of gauze was used to make pressure upon the divided vessel. It is evident that the operation was done with such aseptic care that prompt union without septic inflammation occurred. Whether the abscess, which subsequently occurred, was caused by the blow upon the side of the head received two months and a-half after the original injury, it is impossible to determine. From the short time after this injury that the abscess opened spontaneously, one would be led to believe that a chronic abscess had already formed before the blow upon the side of the head called the patient's attention to the matter.

Since the time that the gauze was removed, which is now about five weeks, the patient has had no special difficulty with the wound, except that he complains at times of pain in the head, and there is a protrusion of brain substance at the opening in the skull. This protrusion was to be expected, because there was neither dural covering nor bone over the brain at the site

of operation It was impossible, and it would have been unwise, to cover in the opening in the calvarium

The man has been irritable during convalescence and occasionally has violent convulsive seizures, clonic in type, accompanied with opisthotonos and pain in his head The wound is in good condition, and pulse, respiration and temperature are practically normal He is liable to get convulsive attacks and become excited, if he is kept in a ward with other patients or in a place where there is noise and confusion from people passing to and fro When he has mild convulsions, which occasionally take place, the seizures are focal in type, the muscles of the neck pull his head to the right with the chin upward very much as if the spasm were in the left sternomastoid muscle, the head and eyes are deviated to the left without twitching of the face and eyes At such times there is no involvement of arms, feet or legs in the convulsion Recently he has been more apt to have the severe convulsions than the milder ones In these there are clonic spasms of the extremities, with opisthotonos and violent shouting The man is conscious and rational, except at the time of his convulsion The convulsions, when severe, are described by the resident physician, Dr Hall, as follows —“ The arms are sometimes extended, sometimes flexed, and shake with a fine tremor, being held quite rigid The lower jaw is moved slightly up and down, the chin is rotated to the right and slightly elevated as if by action of the left sternomastoid The eyes roll upward, sometimes looking directly upward, more often being deviated to the left They are held immobile In addition, the patient sometimes raises his hips up from the bed and rolls and threshes about, but the movements are in no definite order They are such as any patient would show when suffering intense pain After the convulsion is over the patient frequently complains of intense pain in his head and points to the right anteroparietal region” For a time these convulsions were very frequent and severe Some of them are accompanied by vomiting, which occurred after the convulsion was over

Large amounts of bromide potassium, some chloral, and hyoscine and codein have been used to quiet him Occasionally it was necessary to confine him with straps or bandages Chloroform has sometimes been given by inhalation to stop the convulsion

The eyegrounds are apparently normal There is no discharge from the ear There are some casts in the urine On account of the result of the recent urinary examinations, he has been given Basham's mixture as a diuretic

The convulsions have seemed to be of a type which might, perhaps, be described as hystero-epileptiform

#### THE EFFECTS UPON GLANDULAR TISSUE OF EXPOSURE TO THE X-RAYS

DR WILLIAM J TAYLOR read a paper with the above title, for which see page 431

DR A G ELLIS said he had made no studies of X-ray tissue—those reported in the paper mentioned by Dr Taylor In the enormous literature which was accumulated, however, are many references to the untoward effect of this agent, and in the present state of our knowledge it should be used with caution The numerous cases of sterility in X-ray workers reported by Dr F Tilden Brown are examples of its unexpected influence The cases cited by Dr Taylor further emphasize the necessity of careful and discriminate use of this illy understood force

DR JOHN H GIBBON spoke of a case of enlarged cervical glands in which he had operated during the past summer The patient in the spring had a prolonged treatment with the X-rays The glands were most difficult to remove because of adhesions It required two hours and ten minutes, with the help of an experienced assistant, to remove about thirty glands, whereas the next day twice this number were removed with the help of an inexperienced assistant in one hour Every gland was so adherent that it required minute dissection to separate it from the surrounding tissues It was impossible to remove the glands in a continuous chain

It is regrettable that so many of the less radical measures which are employed in the treatment of surgical diseases cannot be used without interfering with subsequent operation, but yet this is a claim which is frequently made for them No better illustration of this statement can be given than the difficulty encountered in operating for hernia where the injection treatment has been tried

DR RICHARD H HARTE recalled a case of a child in which the cervical glands had been treated for some weeks with the X-ray, hoping by this means to avoid an operation. When, however, removal of the glands was attempted, the dissection was very difficult, as all the anatomical conditions were changed. The glands were adherent to the surrounding tissues, requiring forced dissection. In the course of a couple of weeks a small gland, which had been overlooked at the time of operation, broke down and suppurated. Dr Harte is inclined to regard the use of the X-rays in cervical glands of the neck as most unsatisfactory.

# TRANSACTIONS

OF THE

## CHICAGO SURGICAL SOCIETY.

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*Stated Meeting, November 3, 1905*

The President, DR D A K STEELE, in the Chair

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### PERFORATED GASTRIC ULCER

DR WILLIAM HESSERT reported two cases of perforated gastric ulcer and presented the patients

CASE I—D H, aged 19, enjoyed good health up to seven years From that time until fourteen she was in poor health At fourteen the stomach symptoms began with pain in the region of the stomach, with vomiting, sometimes before, sometimes after, meals She vomited blood Her symptoms came periodically with remissions during which she felt fairly well and regained some strength In June, 1903, she had a severe attack which was characterized by the sudden onset of severe pain in the left lower portion of the abdomen This was so severe that she fell in a faint She vomited Pain was relieved after some hours, and subsided after three days The abdomen became greatly distended, she was very sick for ten days, and was in bed about five weeks longer After recovering from this attack, the periodical pain and vomiting recurred as before Her general health was poor and she rarely felt really well

July 5, 1905, at noon, she was seized with a pain again in the left lower quadrant of the abdomen She had not yet had any dinner Dr D E Murphy saw her shortly after and found her in severe pain, shock, small, rapid pulse, cold extremities,

costal breathing, no vomiting, abdomen retracted and rigid. The whole left side of the abdomen was tender and the left abdominal muscles were tense. Morphine was given hypodermically. The speaker saw her at 8 P. M. in consultation. She had reacted somewhat, pulse still accelerated and small, slight rise in temperature. She had not vomited. Pain was somewhat relieved, but the abdomen was still tender and tense on the left side. She was put on rectal feeding and nothing whatever given by mouth. The pain subsided largely, and she felt fairly comfortable for two days, when pain increased and the abdomen became slightly distended. Her pulse and temperature went up to 114 and 101°, respectively. She was then removed to the Polyclinic, where she was operated upon sixty hours after the first onset of symptoms. A longitudinal incision was made to the left of the median line from the costal arch downwards, three inches in length. On opening the peritoneal cavity some turbid fluid escaped. The stomach was pulled out of the wound. A perforation was found on the anterior wall of the fundus near the lesser curvature. The opening was sharply outlined, and was one centimeter in diameter. The tissues for a distance of three centimeters around the opening were thick and indurated, and of a dark red color. There were no adhesions anywhere about the stomach. The stomach contents had evidently escaped into the subphrenic space, there being evidence of peritonitis here, but the cavity below seemed but slightly involved. The opening was first closed with through-and-through silk sutures. Some difficulty was encountered, owing to tearing through of the sutures. The whole involved area was then inverted with two rows of silk Lembert sutures. No other perforation was found, nor scars. The field of operation was then sponged out and two cigarette drains inserted and the wound closed in the usual manner.

On coming from the table the pulse was 120, temperature 100.8°. She vomited some dark fluid subsequent to operation. She was put on rectal feeding. She rallied nicely from the operation, and did not have a great deal of pain. On second day her temperature was 100°, and pulse 70 to 80. In fact, for a week after operation her pulse went down to 60, and became somewhat irregular. Bowels moved regularly. Wound draining freely. During the second week her pulse and temperature were about

normal On the tenth day she was, for the first time, allowed fluids by mouth, liquid peptonoids being given This agreed with her On the twelfth day broth and peptonized milk were given Nutritive enemas were continued as they were so well borne On the fourteenth day toast, milk, ice cream, and oatmeal were given On the sixteenth day egg and toast At the end of three weeks her wound had completely healed She was on a light diet, had no pain, and was digesting her food well Bowels regular, patient feeling fine, weight 82 pounds

November 3, 1905 Her present weight was 126 pounds, more than she had ever weighed before Her health was fine There were no gastric symptoms whatever Patient able to eat all kinds of food without distress

CASE II—Female, aged 62 Gave a history of having had symptoms referable to the stomach for the last fifteen years Pain came on periodically, lasting for a month or so, during which time she vomited blood There were periods of remission for a few months, during which she felt fairly well, and enjoyed the usual nourishment She gained some in strength, but after a while the symptoms recurred There were pain and vomiting again This condition persisted for fifteen years, when, last October, she was admitted to the Cook County Hospital to the medical service Previous to this time she had been in bed for five or six weeks or more, and was getting weak, nourishment was poor, no appetite, frequent vomiting, and a great deal of pain She was transferred to the surgical side at the beginning of December Before that time she was considerably emaciated An indefinite mass could be felt in the left hypochondrium A probable diagnosis of malignancy was made, and an exploratory laparotomy performed Dr Hessert found the mass was situated in the region of the lesser curvature on the posterior surface of the stomach, and in pulling the stomach up and manipulating it, in order to determine its outline, suddenly gastric contents escaped, and he found there was a perforation At the time, he thought perforation was due to manipulation, but later developments showed that it was not due to manipulation, but to an old ulcer which had perforated and had resulted in the development of a large mass of indurated tissue, a perigastritis At the time of the operation a probable diagnosis of carcinoma was made and after having sutured the

opening in the stomach, the abdomen was closed, with the belief that the case would take the usual course of carcinoma. In this he was agreeably disappointed, as the patient grew better, though very slowly. She vomited and was unable to take much food. But this mass steadily decreased in size, so that in May, some five months after the operation, the former tumor had entirely disappeared, and long before this time he made up his mind that the patient did not have carcinoma, but a chronic perforation of an ulcer in the posterior surface of the stomach. She had so much pain and was in such distress that he agreed to operate again in the hope of relieving adhesions or relieving her condition by some further procedure. Accordingly, a second operation was performed on May 13, of this year. Careful examination of the stomach failed to reveal scarcely any traces of the former lesion. There was absolutely no induration, but simply a small scar at the site of the previous perforation. There were considerable adhesions about the stomach and the latter was adherent to the abdominal wall, but still the old induration was gone, showing how such a chronic perforating ulcer, with perigastritis, may simulate a carcinoma. He decided not to do a gastroenterostomy, but simply to loosen up the adhesions, and since that time patient has regained her health fairly well, but not as completely as one would wish for. She had considerable pain now at times. She was able to eat everything at times, but at other times could only enjoy a little milk or liquid food. She has vomited blood since the operation, but there was no sign of a tumor mass present.

DR L. L. McARTHUR stated that in the present trend of surgical opinion, when the pendulum was swinging in favor of gastroenterostomy for every ulcer or symptom of ulcer of the stomach, he felt that a word of commendation and praise was due to Dr. Hessert for his courage in withholding gastroenterostomy under the conditions which obtained in the first case. If one followed the book-lore, as now obtaining, the tendency was to simply make a puckering string suture of the perforation and do a gastroenterostomy. To do this in a patient suffering with peritonitis of an extremely acute type, entailed an added shock and risk to the patient, which, in his opinion, was not always necessary, and particularly not necessary where a perforation ap-



peared definitely in a large, single, indurated, round, perforating ulcer of the stomach. In such cases he believed the practice of Dr. Hessert to close the opening and be content with that for the time being, rather than to complicate matters by the addition of a gastroenterostomy, was the more desirable practice, although not that which was now taught. It did not complicate matters very much, before putting in a puckering string and Lembert sutures, to make an excision of the indurated edges, bringing more healthy tissue together, perhaps avoiding leaving behind cicatricial tissue, which pathologists were inclined to believe formed a basis for later possible carcinomatous development. This was easy of performance and supplied far better tissue for the stitches than that which was furnished when leaving this indurated base. Other things being equal, he would suggest the removal of that indurated base, bringing all the structures together as in a suture of a wound of the stomach. He believed, too, that the emphasis Dr. Hessert placed upon the appearance of pain laterally, either in the left or right flank of the abdomen, frequently obtained with perforation of the stomach and was due purely to the anatomical landmarks which guided fluids in the outer gutter along the right or left of the colon. The emphasis, too, which Dr. Hessert placed upon the avoidance of medication by the stomach, or the administration of emetics to clear out a supposed case of indigestion, was extremely desirable. The speaker recalled a case in which red pepper and ginger ale, to provoke emesis, given to a patient with gastric perforation, added tenfold to the amount of pain. Another fact which was extremely significant in acute perforations of the stomach, was the board-like rigidity of the abdominal muscles which the sudden gush of the infective material seemed to induce in perforation of the stomach, far more marked, he thought, than in duodenal perforation, and he was sure very much more marked than in the alkaline contents from perforation of the appendix.

DR WILLIAM M. HARSHA was reminded of a case he saw recently. The patient was a woman of 60. She was taken with very severe agonizing pain in the right side in the subhepatic region. She was brought to Chicago, and he saw her about six days after the onset of the attack. There was a board-like rigidity of the abdomen, but it was not in the iliac region. It was

limited sharply to the right hypochondrium. A diagnosis of perforated gall-bladder was made by her physician. An incision was made over the site of the gall-bladder, and nearly a quart of fluid found here, circumscribed, which did not go below the colon or into the iliac fossa, but between the liver and chest wall, and was confined to that area. The anterior surface of liver was stained by fluids. The patient was profoundly toxic and went on to fatal termination.

## HALLUX VALGUS

DR A. E. HALSTEAD showed skiagraphs of a case of hallux valgus before and after operating. He also exhibited the patient, and mentioned the method of operating, which differed a little from the ordinary routine followed by surgeons in general.

He mentioned briefly the opinion of the writers of the present time regarding the pathology of hallux valgus. Formerly the opinion of Virchow that the condition was essentially an arthritis deformans, was generally accepted. Of late years numerous writers have disputed this theory. At present it is generally considered as being static in origin, the change at first being due to ill-fitting shoes. The relative lengths of the great and second toes undoubtedly has a bearing on the early changes that take place. Those in which the great toe exceeds in length the second are more prone to this deformity than those having the toes of nearly uniform length. The narrow-toed shoes first cause an abduction of the great toe, producing a prominence of the metatarso-phalangeal articulation. Pressure upon this prominence causes an inflammatory thickening of the soft tissues, especially of the bursa over the joint. Continuation of this pressure soon induces a periostitis with deposit of bone at the head of the first metatarsal. Abduction of the phalanx brings pressure upon the outer portion of the articulating surface of the metatarsal and produces in time distortion of the joint with atrophy or destruction of the articular cartilage, and hyperostosis of the inner surface where the pressure is lessened. The inflammatory process spreading from the compressed soft parts also plays a certain rôle in bringing about changes in the joint that closely resemble the changes found in arthritis deformans. He

stated that some writers laid stress upon the place of attachment of the extensor tendon of the great toe as a determining factor in the production of hallux valgus. Just how this factor was responsible for the deformity he was unable from his observation to state. He had observed that after resection of the head of the metatarsal and freeing the inner aspect of the joint of fibrous tissue, while the insertion of this tendon was undisturbed, it had a tendency to draw the toe outward, maintaining the deformity.

In operating for the relief of hallux valgus, he employed an incision, slightly curved, over the inner surface of the joint. The inflamed bursa was excised. The joint was exposed and the head of the metatarsal removed by means of a Gigli's saw. The extensor tendon was fastened well down on the inner side of the first phalanx without severing its attachment beyond. The posterior portion of the sheath was divided about  $\frac{3}{4}$  of an inch proximal to the metatarso phalangeal joint, the sheath split and the reflected portion brought down and sutured between the cut end of the metatarsal and the base of the first phalanx. This supplied a new synovial membrane for the joint, and effectually prevented an ankylosis. The wound was closed, most cases without drainage. When there was suppuration about the joint previous to the operation drainage was employed.

The foot was dressed by incasing the inner half in a molded plaster splint, patient allowed to walk after the first day.

He stated that in a series of about 15 cases treated in this way the results had been uniformly good, the patients being free from pain and excepting when extensive infection before the operation had existed, there was freer movement of the joint. In none was there complete ankylosis.

DR ALEXANDER HUGH FERGUSON said he had made a curved incision over the upper surface of the joint through the skin down to the fibrous structure, exposing the tendon, then a longitudinal incision on each side of the tendon liberates it, still leaving it in its sheath, a long incision on the inner side exposes the bones and joint, excision of the head of the bone very much after the manner mentioned by Dr Halstead is now completed, leaving the sesamoid bone. He placed the internal lateral ligament as a fold between the bones and sutured it there with catgut. The tendon is free, and a good deal more extension than

was represented in Dr Halstead's case is obtained. However, the result in Dr Halstead's case was excellent, considering there was suppuration.

DR CHARLES DAVISON questioned the necessity of putting fascial tissue in between the ends of bone where the articular surface of the phalanx was not interfered with. He had done the operation many times, cutting the distal part of metatarsal bone away carefully, leaving the articular surface of the phalanx, with the idea that there would be no adhesions, no ankylosis, if the articular surface was not interfered with. In quite a series of cases he had seen no trouble from ankylosis, and all of his patients had free motion when he saw them last.

DR HALSTEAD, in closing the discussion, stated that in advanced cases the synovial membrane and the cartilage of the joint were likely to be destroyed, and one would find nothing but spongy bone. This was true in his case. He had had about fifteen cases that were treated by operation, and his experience and that of others was that ankylosis was almost the rule where there was no intervening tissue placed between the ends of the bone.

In a paper published in the *Zeitschrift für Chirurgie* quite recently, a large number of cases were reported which showed that ankylosis was invariably the rule, when resection of the joint alone was performed. If there was a normal articular cartilage to the phalanx, it would be all right, but in this case the cartilage was destroyed leaving only the articular end of the phalanx bare and eroded. He had tried subcutaneous connective tissue fat and it worked very well, but it was much more convenient to take a piece of tendon sheath to interpose between the joint surfaces. One could utilize a piece of tendon sheath with greater ease than he could take a flap from the under surface of the skin.

#### ACUTE POST-OPERATIVE DILATATION OF THE STOMACH

DR A. E. HALSTEAD read a paper with the above title, reporting a case following nephropexy.

The patient presented the clinical features and termination of a typical case of acute dilatation of the stomach following fixation of a movable right kidney in an apparently otherwise healthy young woman. The clinical diagnosis was verified at autopsy.

DR ALEXANDER HUGH FERGUSON said he lost a patient from acute dilatation of the stomach ten years ago. The operation was performed for appendicitis between the attacks. After the anesthetic, the patient was in good condition, his pulse was good, temperature normal, etc. As far as the temperature was concerned, the patient had no rise of it at any time. He died on the eighth day with enlargement of the abdomen, persistent nausea, persistent vomiting, and increased dulness. Post-mortem examination revealed the stomach filling the abdominal cavity and protruding into the pelvis to some degree. The area of operation was normal. There was no peritonitis, no adhesions. Obstruction was found at the pylorus, and although one could pass the ring finger through the pylorus, still it was obstructed by being acutely bent upon itself. The duodenum was not enlarged, but slightly smaller than normal. If the obstruction were between the duodenum and jejunum, then there would have been dilation of the duodenum.

The next case was one in which he removed the cecum. Vomiting and dilatation of the stomach persisted after the third day. The stomach was washed out every three or four hours, but the man soon became tired of this and decided to lavage his own stomach, which he did, by placing his head down near the floor and a pillow under his stomach. This man is alive and well to-day. In addition to these two post-operative cases of acute dilatation of the stomach, he had had three others, two in children, and one in a man, from over-distending the stomach with food.

DR E WYLLYS ANDREWS said that he reported some years ago five cases of drowning in fecal vomit in cases of intestinal obstruction, and discussed at that time the peculiar mechanism of the accident. He was led to infer that the two orifices of the stomach were dilated when this drowning took place, and the intestinal contents from reverse peristalsis poured through the stomach out into the throat. Only in that way could he account for the enormous quantity ejected in the fatal cases. Since he had heard Dr Halstead's paper and the discussion, he thought these cases might have been instances of acute dilatation of the stomach.

DR L L McARTHUR said he had learned his lesson in

regard to acute dilatation of the stomach through the death of a very dear friend who had been operated on for hysterectomy. The hysterectomy was made per vaginam. The patient developed no evidence of peritonitis, but had persistent nausea, with vomiting. Cases of acute dilatation of the stomach he believed were always associated with rather long intervals between the attacks of vomiting, then large quantities rather than frequent small quantities of fluid came away. The patient growing steadily worse, weaker and weaker, yet presenting symptoms which were to them intestinally obstructive in character, at three o'clock in the morning on the third day Dr Frankenthal asked the speaker if he would not make an artificial anus to overcome a possible intestinal obstruction which might have taken place from adhesions down around the stump of the uterus, low down in the pelvis. To this he agreed, as it looked as if the patient were sure to die. He made a left inguinal incision, found a distended organ, very much like an enormously distended small intestine, but on endeavoring to raise it he found that it corresponded to the stomach. Pulling it out, he found it had the blood-vessels of the stomach, recognized it as the greater curvature of the stomach low down in the left iliac flank. Desisting from further operative interference, a stomach tube was passed and a gallon and a half of dark fluid removed. The incision was closed. We thought we had the case in hand, and that by passing a stomach tube on future occasions we would be able to prevent recurring dilatation of the stomach. The patient had one or two more periods of rest, but the stomach refilled, shortly after which she died. He thought in some cases it was not easy to differentiate between intestinal obstructive vomiting and that accompanying dilatation of the stomach.

DR A J OCHSNER said that some time ago he directed attention to the fact that some patients upon whom gastroenterostomy or stomach operations of any kind had been performed died as the result of acute gastric dilatation. Several deaths had occurred before they had an opportunity to make an autopsy on one of these patients. Since then they had constantly watched this possibility of acute dilatation of the stomach, and had prevented it in several cases by having the patients sit up a few hours after the operation and making gastric lavage in case of any

symptoms Last week a nurse reported in one case two days after a gall-bladder operation that there was something wrong, as the patient's temperature was not elevated, but at the time she reported this fact the pulse could not be counted Dr Ochsner found that the apex beat was very high, that the patient was suffering from dyspnea, and that she had the general appearance of a patient who was just about to die He could not feel the pulse, the heart was simply fluttering Having had this previous experience, and noting the position of the heart-beat and some abdominal distention, he simply introduced a stomach tube, when gas escaped with a good deal of noise, so that it could be heard all over the ward, and immediately the pulse went from 180 to 96 Distention of the abdomen with gas had displaced the heart Had it not been for the fact of discovering the dilated stomach, he thought the woman would have been dead in another hour He believed many patients died in that way, and that if one followed the rule of introducing a stomach tube when a patient was nauseated or complained of gastric distress after an abdominal section, a good deal of trouble and perhaps death could be avoided in a number of cases This patient recovered

#### CARCINOMA OF THE APPENDIX VERMIFORMIS

DR JOHN L YATES exhibited a specimen, which was removed by Dr A J Ochsner from a woman, aged 75, two days previously The diagnosis before operation lay between a neoplasm and an appendiceal abscess Operation revealed both The mass about the appendix was palpable through the abdominal wall, and at the time of the operation it was found that the sigmoid flexure had become adherent across the abdomen A loop of ileum was also adherent, so that the removal required the excision of the loop of adherent ileum and the loop of adherent sigmoid flexure Excision of the cæcum and distal end of the ileum, invagination of the ascending colon, and anastomosing the free distal end of the ileum into the upper portion of the rectum, with an end-to-end anastomosis between the severed ends of the loops of the ileum and the sigmoid A satisfactory microscopic examination had not yet been made

## MALIGNANT GROWTH OF THE HEAD OF THE PANCREAS

DR E WYLLYS ANDREWS showed a pancreatic tumor A patient came under his care about a year ago with chylous ascites, due to a mechanical obstruction of the lymphatic system of the abdomen He very early made out that the patient had malignant trouble presumably of the pancreas Thinking it might be cystic or non-malignant, a laparotomy was made, which resulted in confirming the diagnosis of inoperable malignant growth of the head of the pancreas The abdomen, therefore, was closed, the diagnosis having been easily made by the projection of the pancreatic growth between the stomach and the diaphragm (above the stomach) This patient had chylous fluid removed about seventeen times, and within three or four months afterward died of inanition, the specimen being secured by an autopsy It showed the pathology very well The solid mass—carcinoma—proved to be the head and half of the pancreas Above it the stomach was already invaded by carcinoma, a small piece of liver tissue, which came away, was also invaded The vena cava and aorta were adherent The receptaculum chyli was entirely occluded, collapsed and pressed upon by the tumor mass

## INTUSSUSCEPTION

DR E WYLLYS ANDREWS exhibited a specimen consisting of twenty-four inches of gangrenous intestine, which was the lower part of the ileum, and some living intestine attached, which was resected This gangrenous intestine was removed a week ago by operation from a patient who had intussusception Patient was a young, robust man, who, after jumping five or six feet down and lighting on his feet, began to have typical symptoms of intussusception He was treated for a number of days, and then sent to the hospital An immediate laparotomy was made by Dr Andrews and twenty-four inches of the bowel was found invaginated, beginning some twelve inches above the ileocecal valve, so that portion of the intussusception had descended into the colon At the time of the operation they retracted and brought out the full length of this intussusceptum, which was found to be gangrenous and putrid, decomposition having already set in There was nothing unusual about the specimen



except after removing it the speaker found what he thought was the cause of the intussusception, namely, the presence of a pedunculated, fibro-papilloma, which hung by a pedicle four or five inches long, and had grown from the mucosa of the bowel for two or three inches up from the lower end of the intussusception. It was nothing more than one of those benign polypi which occurred in the bowel generally, and which the surgeon met with not infrequently in operating for hemorrhoids. They were pedunculated and attached themselves to the mucosa and simulated pile trouble. Occasionally they were of the nature of neuromata, but benign. This was like a cherry with a four-inch long stem. He did not discover this until he had removed it, and some time later had examined it. He was doubtful whether the pedunculated tumor was situated at the upper or lower end of the resected piece, but he thought it was at the lower end. The termination of the case was fatal. The omentum from which he dissected off this gangrenous loop of bowel was thoroughly thrombosed—bad looking. He observed thrombi in the radicles, of the veins extending off in some portions of the bowel which looked alive. In order to forestall extension of the gangrene, which would naturally follow thrombosis of the radicles in the mesentery, he removed quite a piece of living intestine. Not only did he do this, but stripped about five or six inches more of the intestine out through the abdomen, bringing it outside. The treatment of the distal or lower stump was simple, namely, cutting it off and invaginating it, going back almost to the cecum. Notwithstanding the removal of fifteen inches of the intestine which was actually dead, the patient was lost from perforation of the bowel a few days later, due to gangrene of the wall of the intestine, particularly that part of it still inside the abdomen, and leakage into the peritoneal cavity of some of the intestinal contents.

## REVIEWS OF BOOKS.

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ABDOMINAL OPERATIONS By B G A MOYNIHAN, M S  
(London), F R C S., Senior Assistant Surgeon to Leeds  
General Infirmary, England Octavo of 695 pages, with  
250 original illustrations Philadelphia and London W B  
Saunders & Company, 1905

Mr Moynihan, in describing the preparation of the surgeon before operation in preantiseptic days, says that the operator felt adequately prepared when he had turned back the cuffs of his coat The illustrations in the old works always depict the surgeon's cuffs and links, illustrations, mourns Mr Moynihan, which are often borrowed and reproduced at the present time However true this may be of the works of other authors and other publishers it is not true of the writer of "Abdominal Surgery" nor of his publishers Considered merely from the typographical and artistic standpoint this book excels the older works just as much as the technique which it describes excels the clumsy methods of which they treated When we compare the standard text-books of our time with the crude descriptions and illustrations of our student days we cannot but wonder at the successful work of our old teachers Most works written twenty years ago are valuable now chiefly for their historical interest One reads them with a serio-comic interest and a half pity for their readers, a certain degree of toleration for the publisher and artist Kelly's "Operative Gynecology" set a new standard of excellence which publishers have been not slow to appreciate and adopt This book of Moynihan is well clad, well printed, embellished with excellent half-tone illustrations, and worthily continues what the earlier work began The text is concise but not abbreviated,

rich in descriptions of detail but not diffuse. The opening chapter contains much valuable and some new information on the bacteriology of the stomach and intestines. The statement that the *empty* stomach and intestine are sterile leads to suggestive reflection on the phenomena of fermentation in the alimentary canal from both the medical and surgical standpoint. The chapter is summarized in seven conclusions at its close, with some remarks on the sterilization of the whole tract. Under the head of preparation of the patient for operation the writer insists on the importance of thorough cleansing of the mouth as a preliminary to *all* operations. Most books restrict this suggestion to cases where the oral cavity is involved. If surgeons follow the author's advice it is not unlikely that the cases of postoperative pneumonia will diminish. We ought not to forget, however, the possibility that many cases of pneumonia of this class do not depend on a mouth infection at all but take their origin in the operation wound itself, being in the nature of infarcts, carried in the circulation from the wound to lung. The author devotes four hundred and sixty-six pages out of a total of six hundred and seventy to the consideration and description of operations on the stomach and intestines. It is hardly necessary to say that nothing of importance in this line of work has been omitted. The descriptions are clear but succinct and are well elucidated by the illustrations. Under the head of "Carcinoma of the Stomach" the statement is made that simple gastroenterostomy has a higher mortality than excision of the stomach which again has a mortality but little greater than that of exploratory incision. As a rule the operation of gastroenterostomy is done and will be done on cases in which excision is evidently out of the question, and such patients will always come to the operating table in worse condition than the earlier cases in which the complete operation can be done. As for the exploration, when the abdomen is closed without any further operative procedure it is because the conditions revealed are too desperate even for the

simplest measures of relief These considerations should receive their due weight in estimating the relative actual mortality of the three operations We can never know what the mortality of gastroenterostomy would have been if done in the cases of excision, nor of excision if attempted in the former cases In the section devoted to operations on the intestines Chapter XX is taken up with the consideration of intestinal localization Credit is given to Mall and Monks, and the latter is largely quoted The succeeding chapters contain an account of intestinal sutures, not all of them, however, for which the reader should be grateful The writer prefers the method of Connell His opinion is that of many surgeons The writer describes a method of suture of his own, but without illustration, which is to be regretted A good illustration takes the place of a page of type and a good deal of pondering thereon The chapter on intestinal obstruction contains much valuable advice The author differs from many surgeons as to the advisability of administering morphine to these patients Indeed he says "There is no absolute need to administer morphine, there is no justification for repeating the dose" Undoubtedly the use of morphine cannot have a curative effect in intestinal obstruction, nevertheless there are not a few conditions which simulate intestinal obstruction, and few operators would be willing to open the abdomen of a patient who was not vomiting who had little distention but much pain, not an unusual condition in obstruction, but one which obtains in other conditions not necessarily requiring operation, yet yielding to morphine Of course no directions nor any number of maxims can supply individual judgment and the ability to nicely weigh the evidence on which diagnosis depends On the other hand it seems to be going a little too far to advise that the drug shall not be repeated in the presence of certain symptoms which may or may not prove to be the result of an obstruction, and in which some delay is a necessary factor in diagnosis Chapter XXXI treats briefly of the surgery of perforation oc-

curring during typhoid fever Chapter XXXII deals with the subject of intestinal exclusion The remainder of the volume is devoted to the surgical diseases of the liver, pancreas and spleen The article on the pancreas and operations thereon is most complete It is not too much to say that it is the most valuable treatise on this difficult and obscure branch of surgery that has yet been published The chapters devoted to it form the logical and worthy culmination of a work which is a distinct addition to the library of every surgeon

ALGERNON T BRISTOW

APPENDICITIS By JOHN B DEAVER, M D Third Edition P  
Blakiston's Son & Co Philadelphia

In this, the third edition of Deaver's treatise on Appendicitis, the author has produced a most attractive work which embraces this ever-interesting subject from the first days of its recognition up to the present time In a careful review of its pages, one finds a complete and exhaustive study of every phase of this many-sided disease, comprising the combined ideas of almost every author of note who has contributed to the literature of the subject In the main, however, the work is based on the writer's personal experience, which now includes several thousand cases It is a notable fact, as Deaver points out, that most of the good work along the lines of diagnosis and technique of operating in appendicitis has been done by English and American surgeons

A chapter of great interest is the one on "The Function of the Cæcum and Appendix" In this the experiments of Macewen are cited, which demonstrate the important rôle played by the appendix in the process of digestion, in that it supplies a goodly quantity of the succus entericus, the glands of Lieberkuhn being much more numerous in the appendix and cæcum than in the small intestine

The chapters on Diagnosis and Treatment together with

Operative Technique are all that could be desired, giving expression to everything that is modern and generally accepted by the surgeon of the present time. The plates illustrating the various incisions and methods of ligation and dealing with the stump are instructive and artistic. The author, as may be supposed, has made certain radical changes in his views on abdominal section in the presence of general peritonitis, notably in the technique of operation and the question of drainage. Several new chapters have been added, including one on "The Blood-Count in Appendicitis" and another on "Typhoid Appendicitis". There are in all sixty-four excellent plates, of which forty-two are new. A bibliography is appended.

WALTER A. SHERWOOD

A PRACTICAL TREATISE ON SEXUAL DISORDERS OF THE MALE AND FEMALE. By ROBERT W. TAYLOR, A.M., M.D. Third Edition.

The third edition of this excellent work has been enlarged and improved in many ways. It is to be commended for its clear and simple method of dealing with this most difficult and troublesome class of cases. The book emphasizes the fact that intelligent and successful treatment can only be undertaken when the underlying cause of the disease is clearly understood.

HOMER E. FRASER

DISEASES OF THE SKIN. By GEORGE THOMAS JACKSON, M.D., Chief of Clinic and Instructor in Dermatology, College of Physicians and Surgeons, Columbia. Fifth Edition. One 12mo volume, 676 pages. Lea Brothers & Co., Publishers, Philadelphia and New York.

As in his former editions, the author has adhered to his scheme of alphabetical arrangement of the diseases, which renders its contents quickly accessible to either physician or student.

To the present volume there have been added several new sections, chiefly varieties of acne, among which the form

Telangiectodes is the only practical one, also several erythematous and granular conditions

The author has written on this confusing subject clearly and concisely, giving symptomatology, diagnosis and treatment in a manner easily grasped. The text is well illustrated by engravings and several colored plates. One of the most pleasing features probably is the appendix, which contains formulæ for the various baths, lotions, powders, ointments, etc

JAMES TAFT PILCHER

CHIRURGIE OTO-RHINO-LARYNOLOGIQUE (Ear, Nose, Sinuses of the Facial Bones, Pharynx, Larynx and Trachea) By GEORGE LAURENS, Formerly Assistant in Oto-rhino-laryngology in the Hospitals of Paris. 8vo, pp 976. G Steinhil, Paris, 1905

This treatise forms a large volume, most attractive, typographically. It is profusely illustrated. The claim of the publishers that it is the most complete work on the subject which has yet appeared seems to be a just one. The delineation by clear and correct cuts of the successive operative steps demanded in the various operations described is one of the most noticeable and valuable features of the book. The book, as a whole, well presents the extensive operative field which the surgery of that portion of the body to which it is devoted has come to involve. The treatise is divided into the five parts—The Ear, the Nose, the Sinuses of the Face, the Pharynx, the Larynx, and the Trachea. The plan of the writer is to first describe the method of examination and exploration of each organ whose surgery is to be treated of, then to discuss the various processes of local treatment applicable, in connection with which latter he dwells fully upon considerations pertaining to illumination, of anæsthesia and of hemostasis involved in each of the craniofacial cavities.

The manner in which middle-ear suppurations are treated is especially noteworthy for its comprehensiveness and complete-

ness The modern radical mastoid operations, the surgery of the lateral sinus, otogenic abscesses of the cerebrum and of the cerebellum, and purulent meningitis are each clearly discussed and the possibilities of relief by opening the skull are studied The results of the involvement of the facial nerve are also analyzed

Larngo-tracheal surgery concludes the work, occupying two hundred pages,—Tubage of the Larynx, Laryngectomy, Tracheotomy, Tuberculosis of the Larynx, Foreign Bodies in the Air-passages—these are chief among the topics discussed in this section Each topic is treated with much fullness of detail, and the book, as a whole, which forms a part of Berger and Hartmann's *Traité de Médecine Opératoire et de Thérapeutique Chirurgicale* may be accepted as representing in its department the teachings of French surgery of the present day

LEWIS S PILCHER

DIE VERWUNDUNGEN DURCH DIE MODERNEN KRIEGSFEURWAFEN.

VON STABSARZT DR HILDEBRANDT Berlin 1905 August  
Hirschwald [Wounds from Modern Military Firearms]

This work of 280 pages presents a very practical discussion of the wounds of modern small-arms in warfare, their prognosis and treatment in the field The experience of the author as staff surgeon in the German army, and as surgeon with the troops in the Boer war and in the Chinese expedition of the allied armies, has given him authority and experience for such a work It is well illustrated, and embodies the most advanced information upon this subject

J P WARBASSE

THE SURGICAL ASSISTANT By WALTER M BRICKNER, B S,  
M D 1905 International Journal of Surgery Co New  
York

This is a manual for students, practitioners, hospital internes and nurses It tells how to assist the surgeon It is eminently practical, and shows that it has been compiled from the surgical



experience of the author. It makes for system in surgical work and should be read especially by hospital internes. It is well illustrated and fills an important place in surgical literature.

J P WARBASE

**CLINICAL DIAGNOSIS** By RUDOLF VON JAKSCH, M D, Professor of Special Pathology and Therapeutics, University of Prague, etc. Fifth English Edition from the Fifth German Edition, Amplified and Edited by ARCHIBALD E GARROD, M D, etc., Lecturer on Clinical Pathology at St Bartholomew's Hospital, Etc. Pp 602. Illustrated, partly in color. London: Charles Griffin and Co Limited. Philadelphia: J B Lippincott Company. 1905.

The fifth edition of Professor von Jaksch's "Clinical Diagnosis" in no wise falls short of the high standard set by the previous editions of this well-known book, nor has it lost anything by the death of its former translator, whose place Dr Garrod has so ably supplied. The work has so long been a standard that little need be said by way of review. One need not eat a whole cheese to judge of its quality and a liberal taste here and there satisfies one of the excellence of "Clinical Diagnosis." One can find flaws, and perhaps a fair criticism is the rather brief mention accorded to the methods of staining blood-smears, especially for detecting the malarial parasites. The very convenient methods for using the various modifications of the Romanowsky stain, especially that of Wright, are not even mentioned. Neither is the Leishman-Donovan blood-parasite recorded, although trypanosomes are fully treated of. Urine is very fully considered, a new form of cast consisting of red blood-cells adherent to very large cylindroidal masses and occurring in occlusion of the renal artery being pictured. Intestinal parasites are very fully described and the chapters on the feces, stomach contents, sputum, and others, are excellent.

HENRY GOODWIN WEBSTER

## METHODS OF MORBID HISTOLOGY AND CLINICAL PATHOLOGY.

By I WALKER HALL, M D, Lecturer and Demonstrator in Pathology, Victoria University, Manchester, Etc, and G HERXHEIMER, M D, Prosector to the Stadisches Krankenhaus, Weisbaden Pp 290 J B Lippincott Company, Philadelphia 1905

The authors of this eminently useful handbook have succeeded in supplying what every laboratory worker as well as the occasional observer will at once recognize as a very desirable addition to his armamentarium—a compendium of histological, pathological and bacteriological technic They have gathered together in compact and accessible form a very considerable number of formulæ for the preservation, preparation, cutting, staining and examination of tissues and organisms as well as careful directions for preparing the various reagents They have carefully arranged and systematized this large mass of technical information which ordinarily has to be sought for scattered through text-books of clinical and microscopical diagnosis or in monographs not always easy of access Their method of grouping the necessary steps in preparing material into chapters devoted to the separate processes is clear and commendable, while the hints as to those methods that their own experience has approved will doubtless be helpful to the more inexperienced Those of broader experience, too, will find a sufficient variety of methods and formulæ to suit their individual choice An extensive bibliography shows the care that has been taken in compiling the book and will be helpful to the investigator who desires to study the original methods for himself Hints as to where apparatus and materials may be obtained, while valuable for English readers, will hardly prove interesting to American students Altogether the book can be heartily recommended to all who are working in laboratory diagnosis

HENRY GOODWIN WEBSTER.

PRINCIPLES OF BACTERIOLOGY Seventh Edition By A C ABBOTT, Professor of Hygiene and Bacteriology, Director of the Laboratory of Hygiene at the University of Pennsylvania Lea Brothers 1905

The latest edition of Dr Abbott's Bacteriology has been revised and brought up to date in its subject matter by the elimination of many of the more infrequent organisms and the addition of newer ones with the improved cultural diagnosis

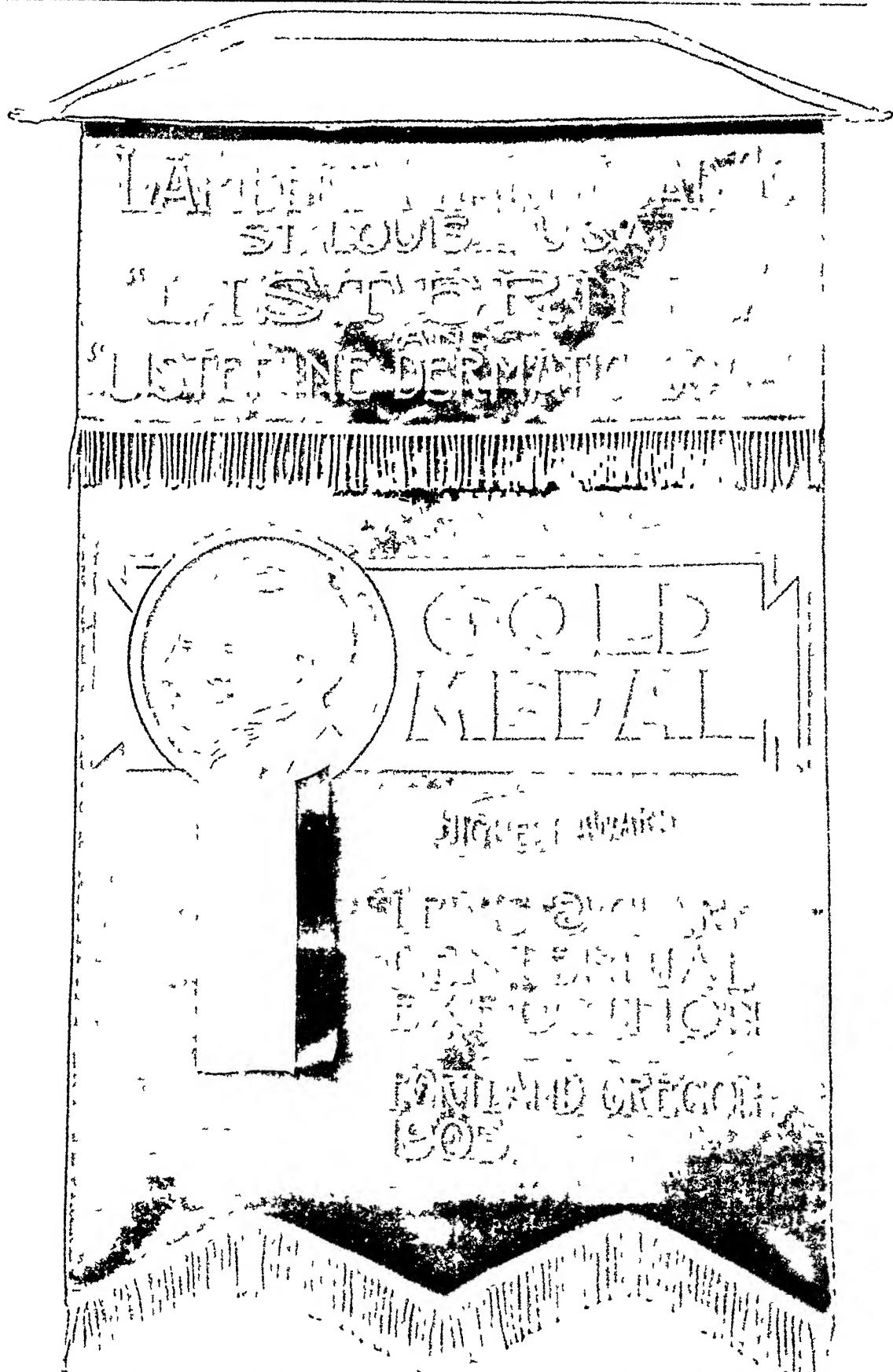
Of particular interest in the latter groups are the paratyphoid and para-colon groups of organisms which have recently attracted attention by their isolation from clinical typhoid fevers.

The Bacillus Dysenteriae group has also been modernized, with the newer methods of isolation and identification of these closely allied organisms In addition the antitoxins of this group have been discussed, with the clinical results of its application in infections from this source

The greatest interest of this volume aside from its careful exposition of the various laboratory methods in the culture diagnosis, and activities of the various bacteria lies in its chapters on infection and immunity The vast amount of literature which has been published on this subject has been carefully reviewed, and the results of the many investigations and researches are tersely set forth in such a manner as to be readily understood by every student of medicine

The chapters alone stamp the volume of such merit as to be designated one of the best of the briefer bacteriologies.

FRANK ERDWURM



**GOLD MEDAL**

ST. LOUIS, 1904



**BRONZE MEDAL**

PARIS, 1900

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**SAL HEPATICA**

The attention of the medical profession is being directed to the use of Sal Hepatica in typhoid fever and inflammatory conditions of the bowels. It appears to be a very safe saline laxative in such affections, being less obnoxious to the organism than sodium phosphate alone or other salines, and is more readily eliminated.

By commingling lithium and sodium phosphates in proper proportions with certain of the "Bitter Water" salts, the manufacturers of Sal Hepatica claim a compound is secured that is superlatively more active than either the lithium or sodium salt alone, or, indeed, than any of the natural purgative mineral waters.

**RELIEF OF SCIATIC PAIN**

We wish to refer to a comparatively new combination of drugs, one which has been used largely for the control of cough, and which has also been employed to a great extent for the relief of pain. It is claimed that its use in many cases renders the same service as does morphine, its influence often lasting for as long a period of time, and possessing the advantage that it does not disturb the digestive tract, nor cause constipation or habit. The remedy we mean is Antikamnia & Codeine Tablets. In several instances in which the patients were suffering from severe acute sciatica, it was found that they acted most satisfactorily. Each tablet contains  $4\frac{1}{4}$  grains of antikamnia and one-fourth grain codeine sulphate. The prompt and excellent result obtained with this preparation is due, in a great measure, to the specially refined and purified codeia which The Antikamnia Chemical Company employs in these tablets. Impure or ordinary codeia irritates, constipates, and depresses, and to avoid this, the said Company purifies its codeia by a special process, and this should be remembered by the physician when prescribing codeia. In treating a case of sciatica, one tablet was followed by a diminution of pain, and after the third tablet, given in half-hour intervals, the pain entirely disappeared. The usual dose is one tablet every two, three, or four hours, according to indication.

**SIR WILLIAM ROBERTS ON DIGESTION**

Sir William Roberts, of London, the great authority on digestion, says "The digestive change undergone by fatty matter in the small intestines consists mainly in its reduction into a state of emulsion or division into infinitely minute particles. In addition to this purely physical change, a small portion undergoes a chemical change whereby the glycerine and fatty acids are dissociated. The main or principal change is undoubtedly an emulsifying process and nearly all the fat taken up by the lacteals is simply in a state of emulsion."

This eminent authority is confirmed in the foregoing view by various experiments by which it has been ascertained that fat foods pass from the lacteals into the circulation by way of the thoracic duct in the form of an emulsion.

Emulsified cod-liver oil as contained in Scott's Emulsion appears in a form so closely resembling the product of natural digestion—as it occurs within the body—that it may well be administered as an artificially digested fat food of the very highest type. In combination with the other ingredients mentioned—glycerine being an emollient of inestimable value—Scott's Emulsion offers to the physician a valuable, exquisite, and rare accession to his prescription list.

**NO MORE POULTICING IN THE U S ARMY**

In a recent notification by the Surgeon General of the United States Army, it is asserted that all the good results from poultices can be obtained in a more cleanly way by the use of wet hot compresses. Hence the order to the army surgeons to drop linseed and linseed meal from army medical requisitions—*Virginia Medical Semi-Monthly*.

We highly approve of its order as far as discarding poultices made of putrescible and bacteria-breeding materials is concerned, for that is what has been done by all up-to-date physicians in private practice, but we supposed that every one in this enlightened age was using Antiphlogistine in all such cases because of its advantages over everything else in permanency, efficiency, and cleanliness. Compare Antiphlogistine, renewed but once a day, with hot compresses renewed every twenty minutes, and we cannot imagine any one using compresses when Antiphlogistine is available.

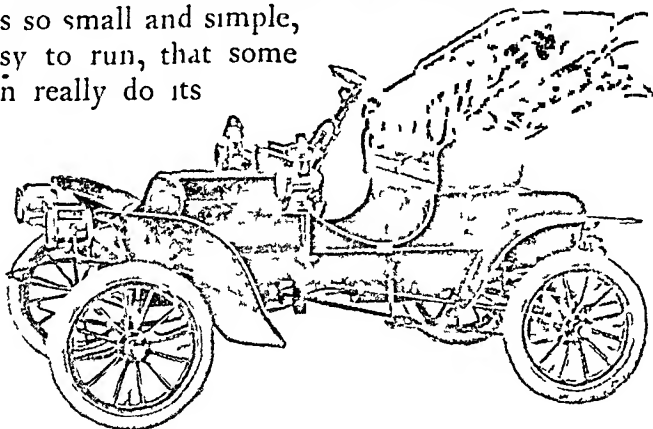
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## RESPIRATORY AFFECTIONS SYMPTOMS AND THEIR TREATMENT

*By Justin Herrold, A. M., M. D.,*

Former House Physician and Surgeon, St Vincent's Hospital, New York City Former Coroner's Physician City and County of New York, Member of the New York County Medical Association County Medical Society, Medical Society of the Greater City of New York, Medical Legal Society Society of Medical Jurisprudence and New York Academy of Medicine

The past few months have afforded me, and no doubt others, opportunities to test the efficacy of the therapeutic qualities of the various remedies vanted as certain to relieve the harassing symptoms attendant on the diseases produced by the bacillus of that nineteenth century infant, "La Grippe"

The feelings of the physician are not heightened when his "stand-bys" serve him so poorly, neither are the feelings of the patient calculated to give him increased confidence in his physician. Where lies the fault—in the opium, in the morphine, in the codeine, in the heroin? No, the fault lies in the unstable (or whatever you may call it) combination, or ill-combined ingredients. In seeking for a remedy to relieve the harassing night cough of an attack of "bronchitis due to grippe," in a member of my own family, I chanced to come across a preparation of heroin, which, of all remedies tried, gave relief. I refer to Glyco-heroin (Smith).

Glyco-heroin, in all the cases in which I have used it, has never caused vomiting, an important point for the physician.

Glyco-heroin allays cough, without doubt much better than any remedy I have used this winter. And that without the sometimes disastrous results of other preparations of the papaver group. Respiration is stimulated, not in number, but in the depth of the inspiratory act, thus full and complete oxygenation takes place. Given full and complete oxygenation, all other symptoms must accordingly diminish, thus temperature and pulse-rate are reduced to a normal condition. It is well known that diminished quantity of urine follows as a result of inflammatory diseases of the respiratory tract, thus the standard quantity of urine is enhanced by the judicious use of Glyco-heroin. In the case of tuberculosis it acts not only as a respiratory sedative, but also as a stimulating expectorant.

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## CATARRHAL DISEASES OF THE NASO- PHARYNX

*By H. M. Marsh, M. D., Auburn, Ky.*

As the season is now fast approaching when this class of diseases take up most of the physician's time, and is the cause of more suffering among more people than all other diseases combined, I wish to say something in regard to a simple and effective treatment of this class of diseases. In this climate, this is the commonest of all diseases, there being very few who do not suffer from it in some of its various forms. Chronic nasal catarrh is in most cases a result of repeated attacks of acute catarrh or 'common colds'. In this short article it is not necessary to go into details or take up time or space with causes and symptoms, every one is familiar with them. My object here is to simply give my plan of treatment plain and simple, yet eminently successful. In the treatment of these cases every physician is well aware of the fact that cleanliness is in most cases all that is necessary for a cure. Every physician also knows that in order to have a perfect cleansing agent it must be both alkaline and antiseptic. My success in treating diseases of this kind, viz., acute and chronic nasal catarrh, including ozena, acute and chronic tonsillitis, pharyngitis, catarrhal deafness, etc., has been due almost entirely to the systematic and thorough cleansing of the mucous surfaces with Glyco-Thymoline. I have been using this ideal alkaline antiseptic in my practice for years, and have never been disappointed in it.

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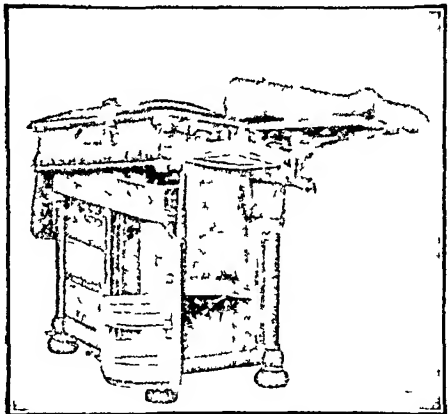
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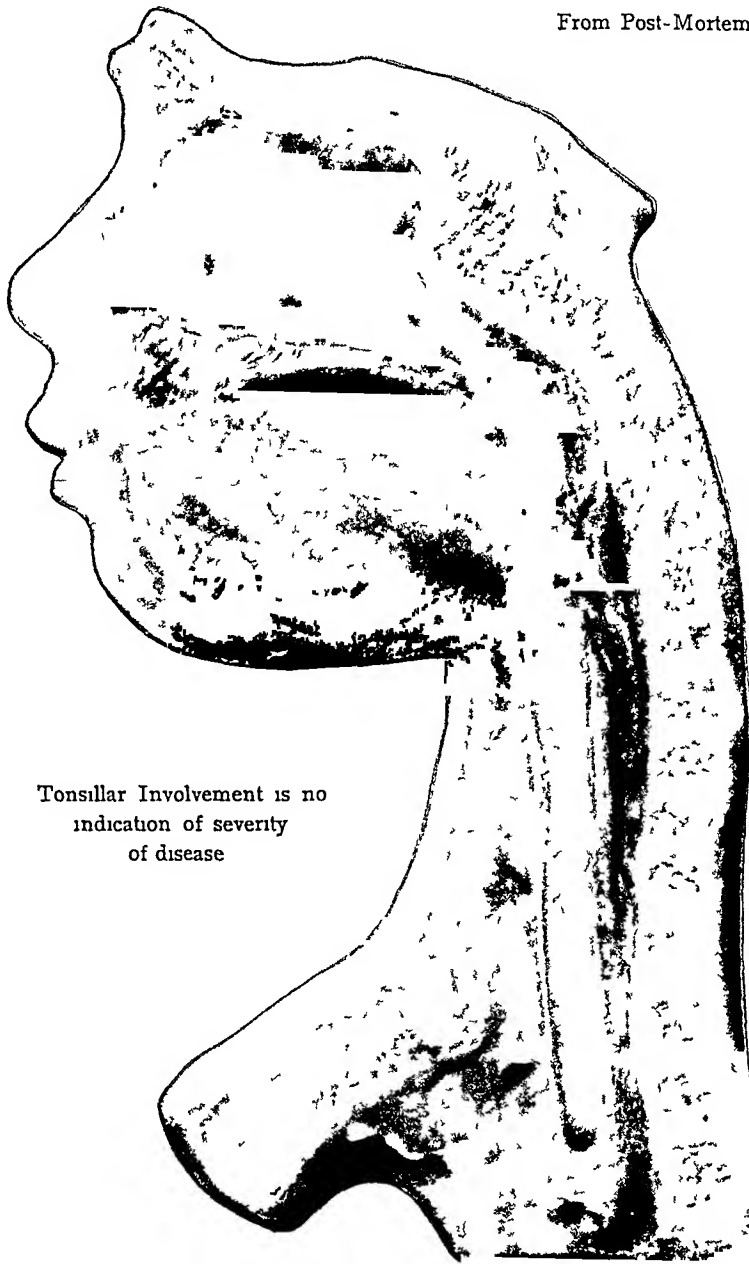
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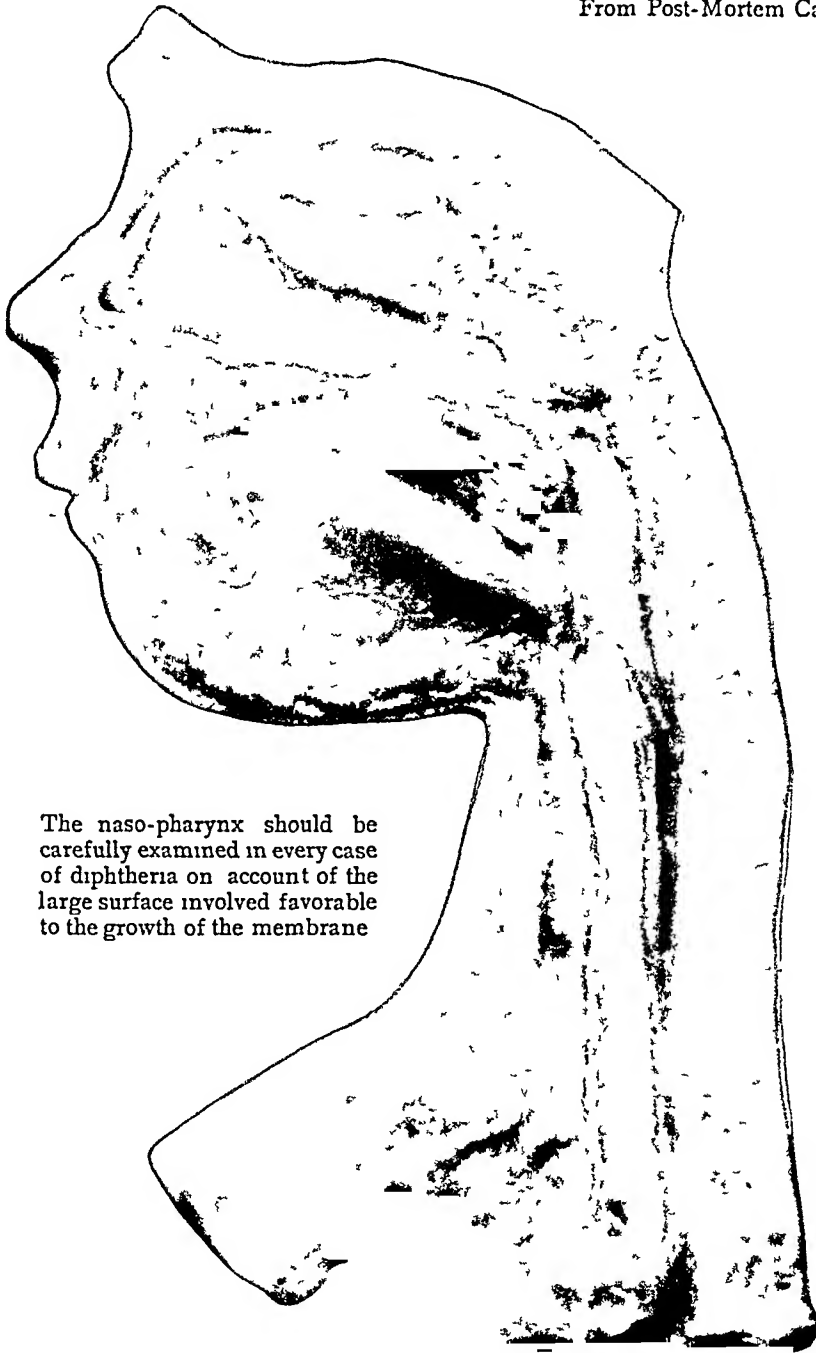
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## Nasal, Post-Pharyngeal and Laryngeal Diphtheria

From Post-Mortem Case



The naso-pharynx should be carefully examined in every case of diphtheria on account of the large surface involved favorable to the growth of the membrane

These are the septic and most fatal types of diphtheria Full doses, 4000 to 8000 units, frequently repeated, are necessary to neutralize the toxins

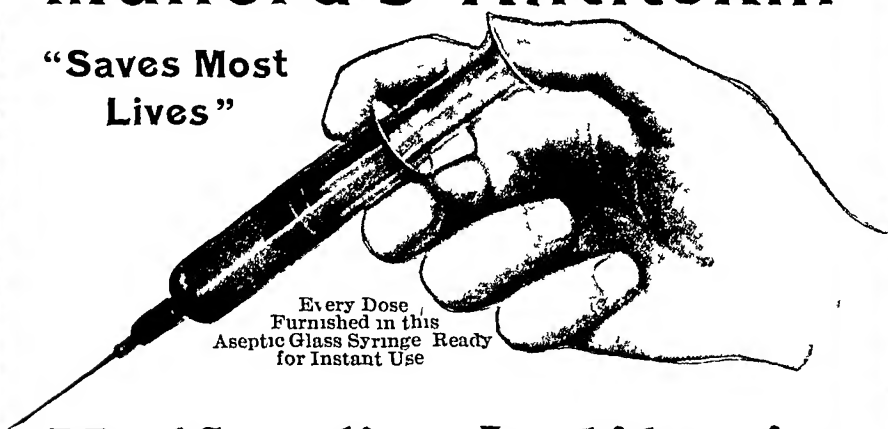
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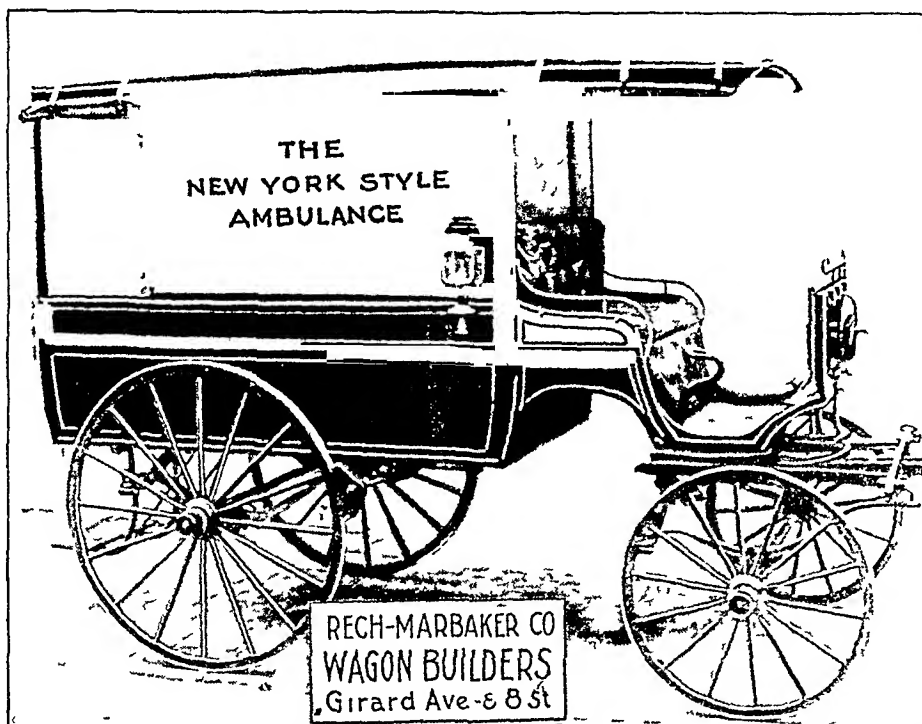
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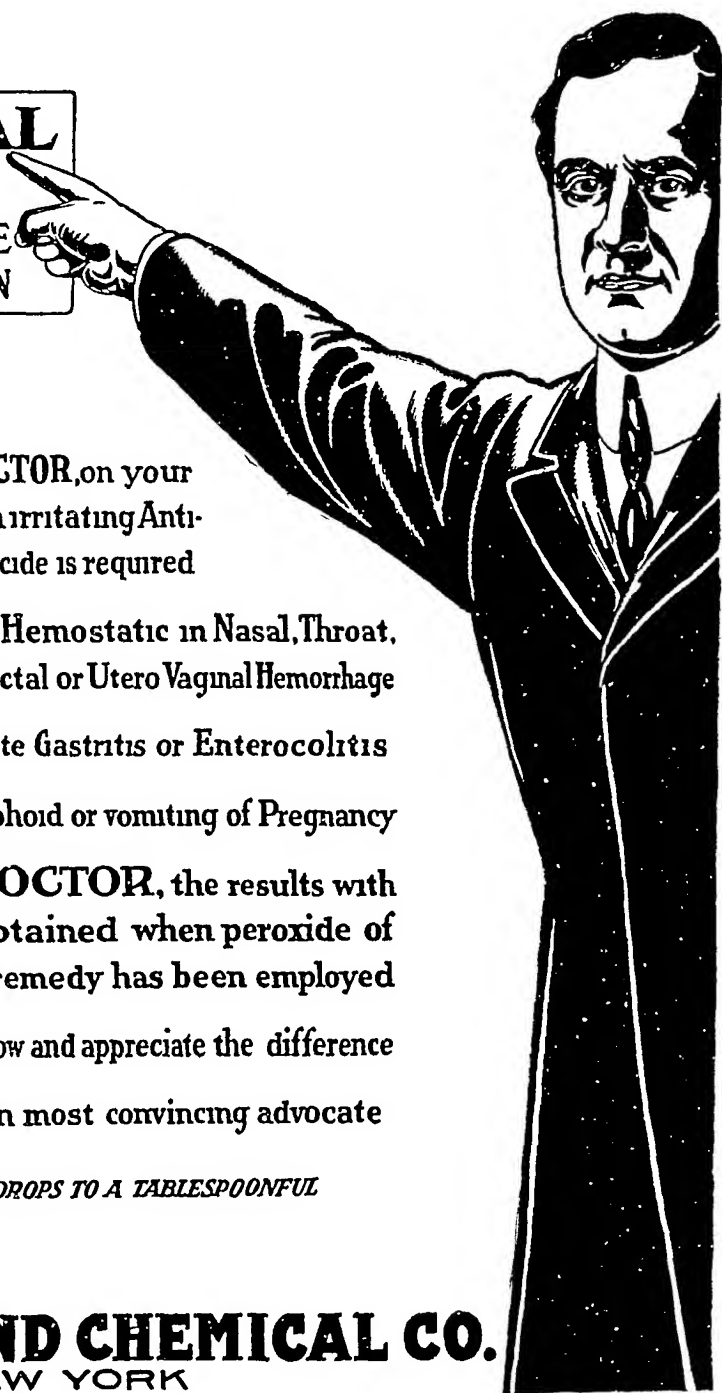
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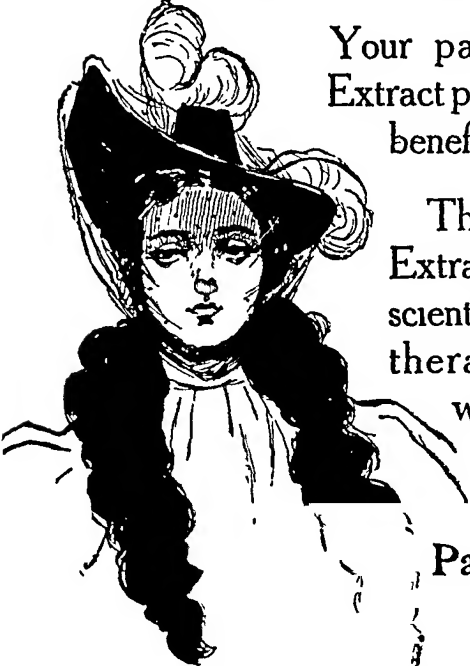
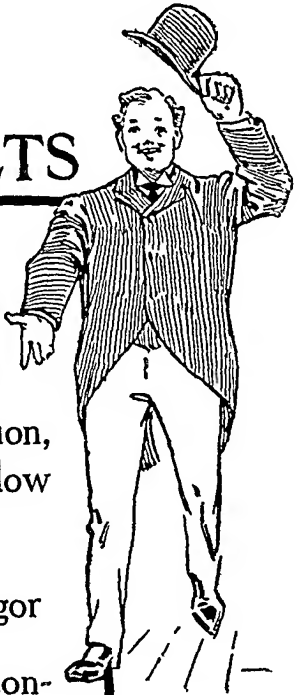
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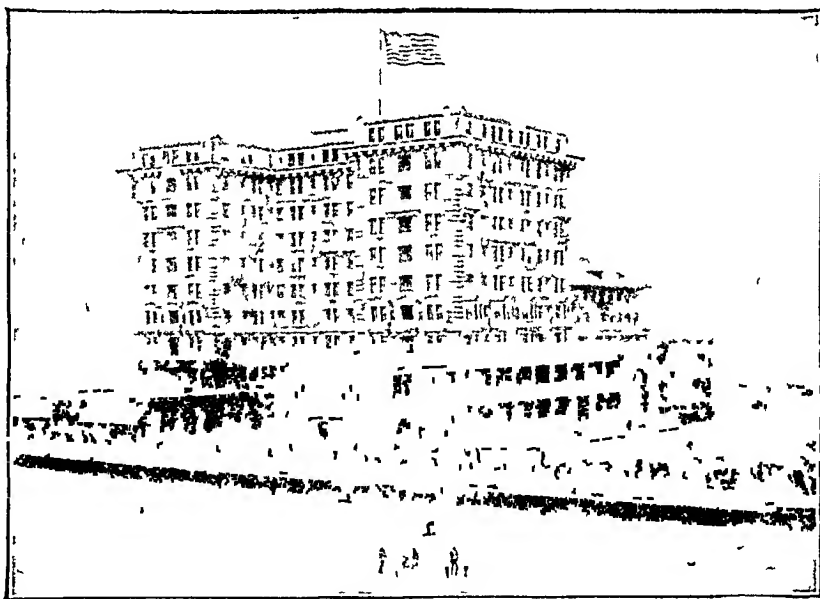
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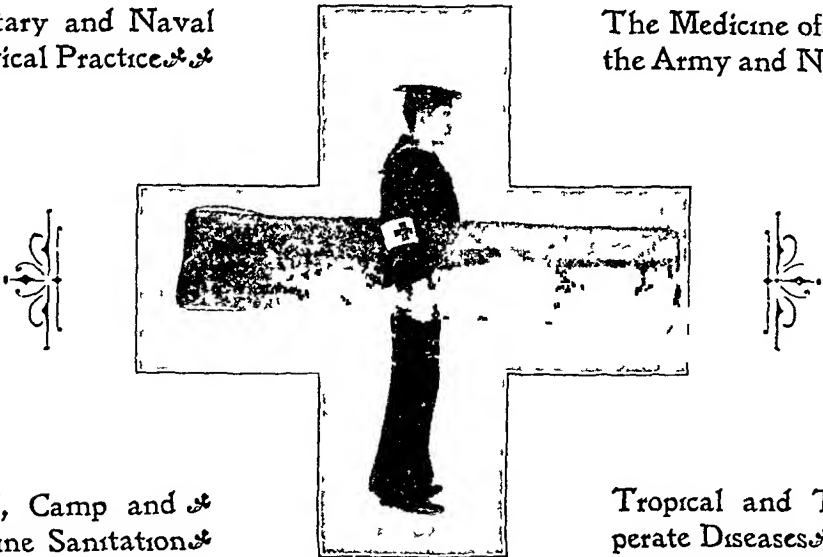
EDITED BY

James Evelyn Pilcher, M.D., Ph.D., L.H.D.,

Major and Brigade Surgeon of United States Volunteers,  
Captain, Retired, in the United States Army

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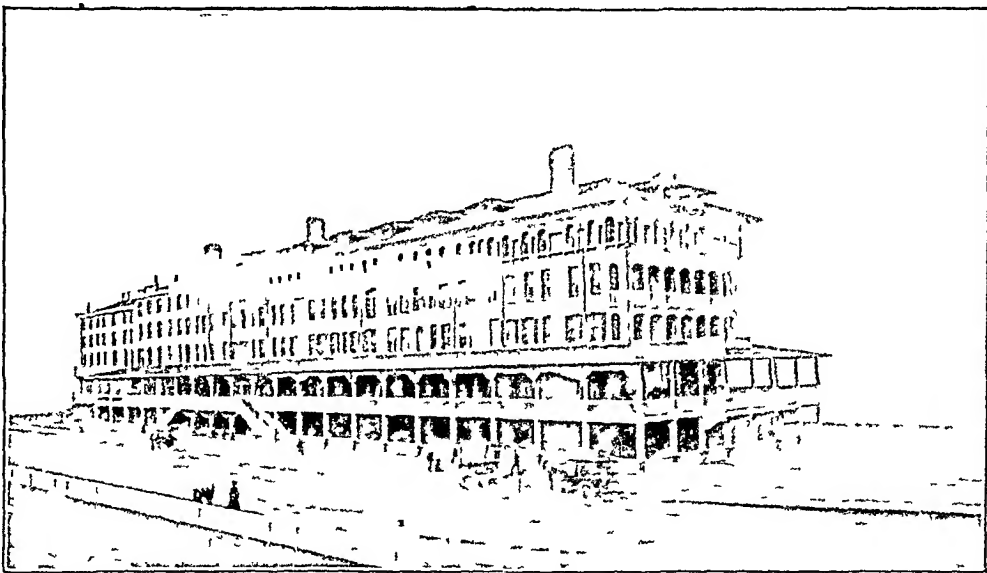
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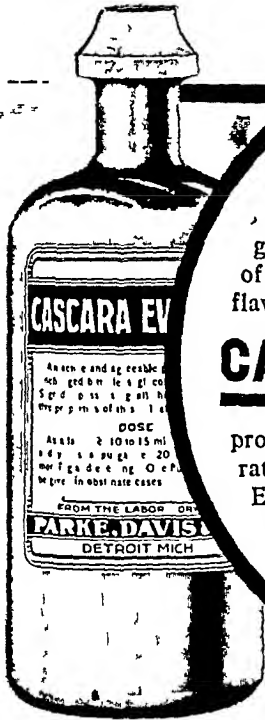
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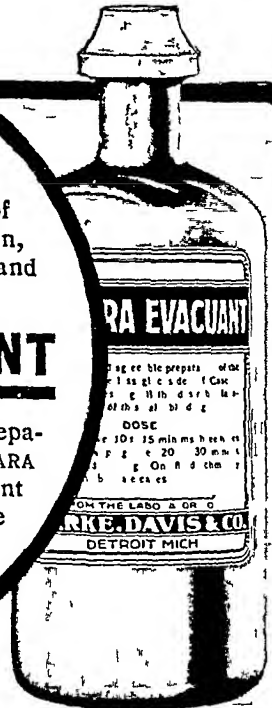
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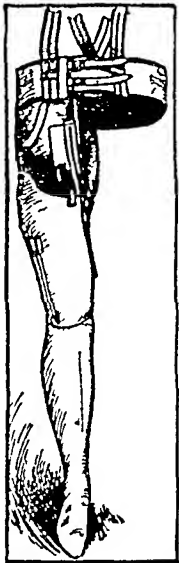
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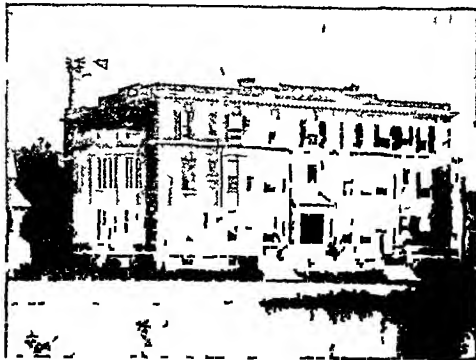
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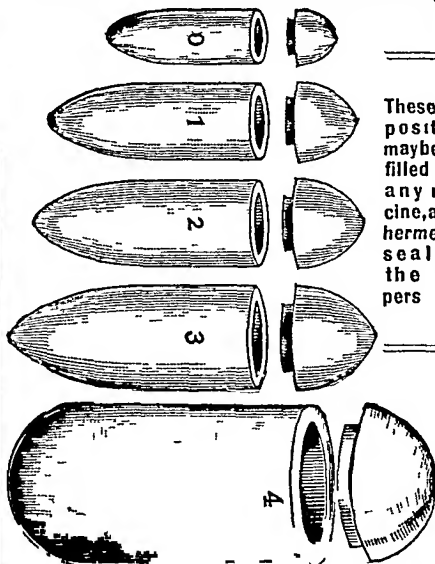
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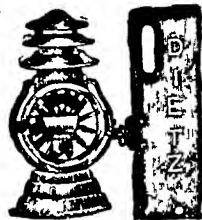
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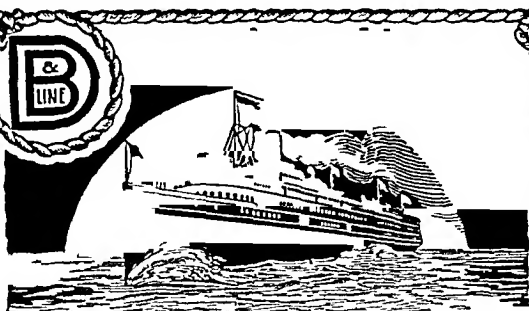
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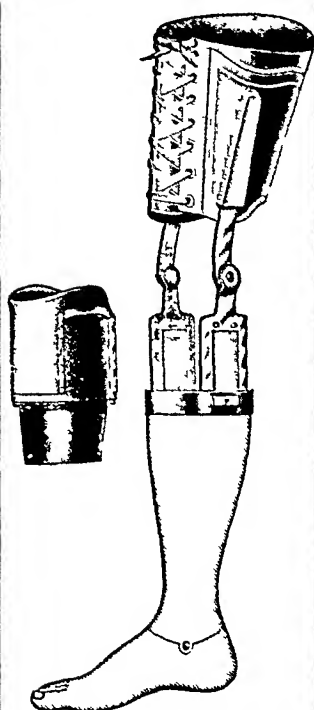
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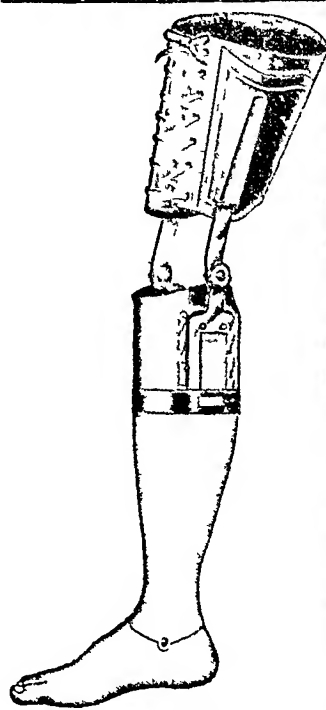
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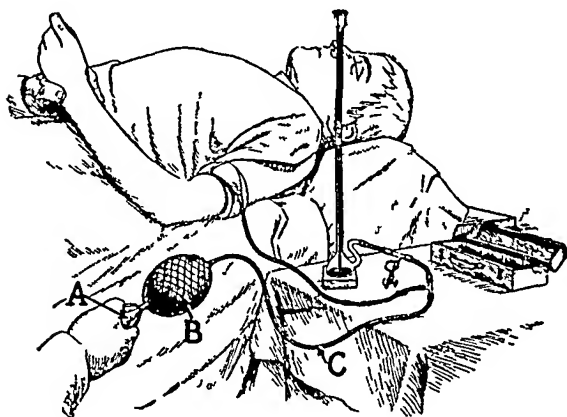


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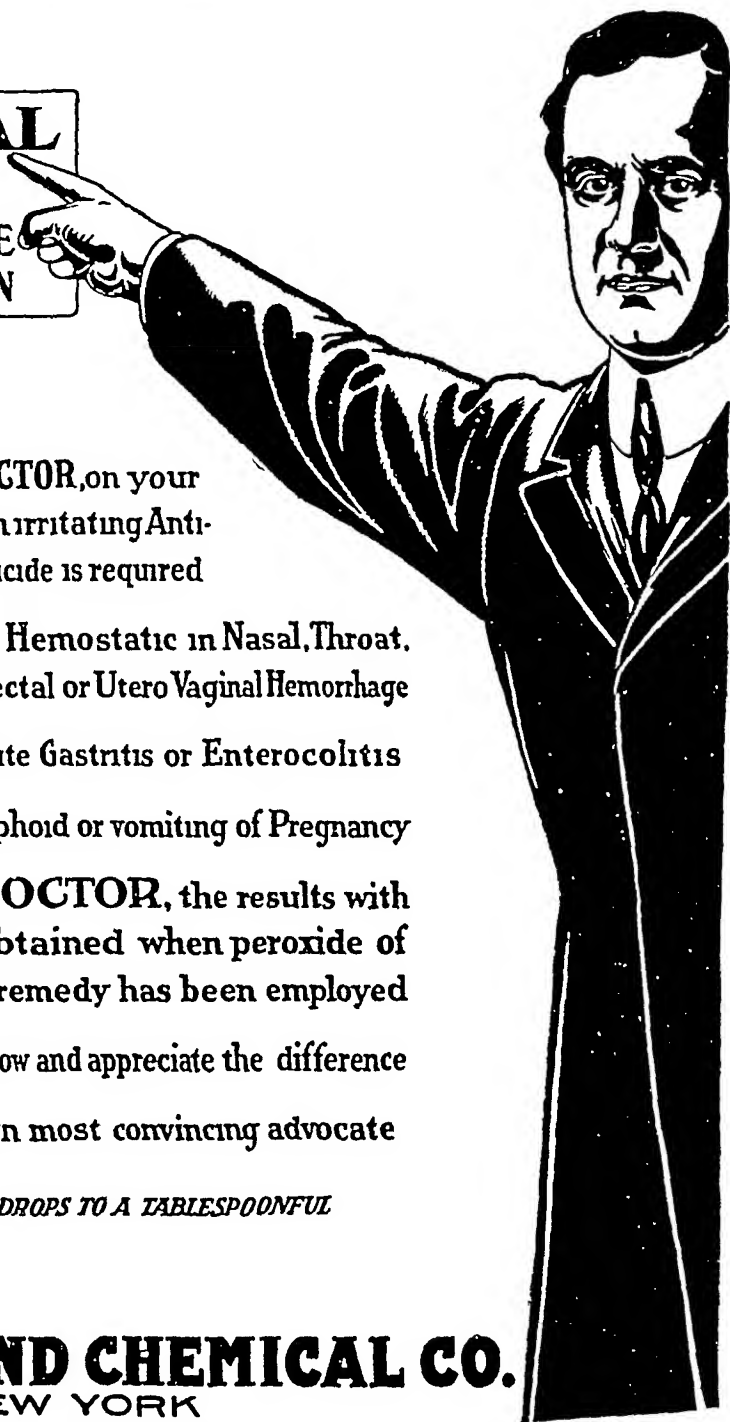
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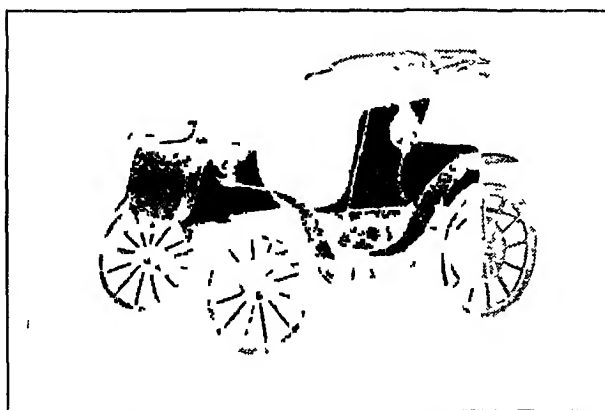
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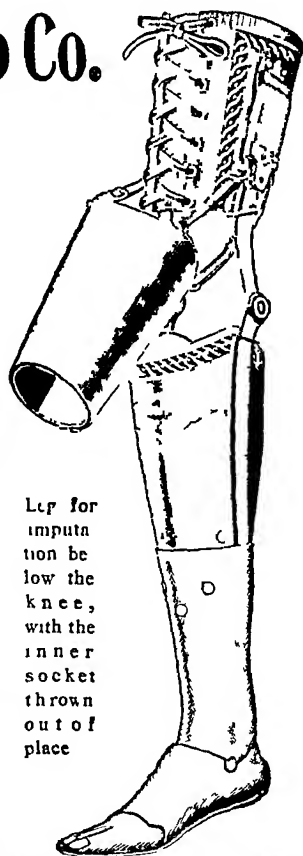
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ANNALS OF SURGERY

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No 6

ORIGINAL MEMOIRS.

AFFECTIONS OF THE THYROID GLAND.

A CLINICAL AND PATHOLOGICAL STUDY ¹

BY GEORGE EVERETT BEILBY, M D,

OF ALBANY, N Y

(From the Bender Laboratory, Albany, N Y)

DURING the past few years as a result of the great advances in the surgery of the thyroid gland, the study of the many diseases of this organ has been placed upon an intelligent clinical and pathologic basis. There still remains, however, a lack of uniformity not only in the classification of the various lesions but also in the interpretation of their etiology and their pathologic significance. It was with the object of adding, if possible, to our orderly knowledge of the pathology of the thyroid that this study of a large series of cases was undertaken.

Material — Since the opening of the Bender Laboratory, in 1896, a period of about ten years, material removed at operation from sixty-one cases of thyroid disease has been examined. It is upon this material, mainly from the surgical clinic of the Albany Hospital, together with three of my own cases, that this present study is based. Including, as it does, examples of all of the more important affections of the thyroid gland, with careful gross and microscopic descriptions, this

¹ Read before the Medical Society of the County of Albany, February 14, 1906

group of cases offers unusual opportunities for investigation
This material may be classified as follows ¹

Class	Disease	No of Cases
I	Simple hypertrophy	26
II	Adenoma	9
III	Recurrent adenoma	3
IV	Cyst	12
V	Metastatic thyroid tumor	1
VI	Exophthalmic hypertrophy	6
VII	Chronic thyroiditis	1
VIII	Tuberculosis	2
IX	Carcinoma	1

These lesions fall naturally into three groups,—the hypertrophies, the tumors, and the inflammations,—and should perhaps more properly be discussed in this order. Several departures however will be made in order to more clearly present the relations of the various lesions. Simple hypertrophy and adenoma as they possess, histologically, much in common, will be considered in sequence, thus affording a better opportunity for differentiation. The exophthalmic type, aside from the fact that it represents a diffuse process, bears no points of resemblance either clinically or pathologically to the simple colloid form and will therefore be considered by itself. The cysts have been found to have such close relationship to the adenomata that they may be considered with the latter.

In the study of each type of lesion, a systematic manner of presentation will be pursued as far as possible. First, a tabulated list of the cases, giving the age of the patient at the time of operation the age of onset, the duration of the disease

¹ To these might be added, to make a classification complete, the sarcomata, the fibromata and the mixed tumors, together with acute thyroiditis, all of which are very rare affections and have not occurred in this series.

I wish here to express my thanks to Dr. Pearce for the privilege of using the material at the Bender Laboratory, and also indirectly to Dr. Blumer, whose careful records has made this study possible. Also I wish to thank the surgeons of the Albany Hospital, especially Drs. Vander Veer, Macdonald and Elting, who have allowed me access to their clinical records.

and the ultimate outcome when possible, will be presented. Following this one or more typical cases will be related in detail, with a brief clinical note and a complete pathologic study. When other cases offer points of interest or importance, not already covered in the quoted cases, attention will be directed to these special features in the general discussion. The etiologic and pathologic significance of the group as a whole will then be considered, and finally, after the consideration of each separate group, a résumé will be made of the main points in diagnosis and treatment of thyroid lesions in general.

I—SIMPLE HYPERTROPHY (COLLOID HYPERTROPHY) TWENTY-SIX CASES

No	Age of onset	Age at operation	Duration
1	22	23	16 mos
2	24	25	12 "
3		68	
4	13	13	6 "
5			
6			
7		30	
8	24	25	12 "
9		43	
10		42	several years
11	42	43	1½ "
12	40	43	3 "
13	16	18	2 "
14	24	27	3½ "
15	13	23	10 "
16	13	15	2 "
17	32	40	8½ "
18	44	62	18 "
19	11	18	7 "
20			
21	15	49	34 "
22		47	
23	36	53	17 "
24			
25		56	
26		28	

Average age at onset, 24 years, average age at operation, 36 years, average duration, 7 years, 4 months, females 21, males 3, sex not stated, 2

CASE I —(Path No 05-1011) Male, aged 18, for 7 years has had enlargement of the neck with at times dyspnoea and some prominence of the eyes noticed His mother is said to have had the same condition

Physical Examination—A symmetrical enlargement of the entire neck anteriorly and laterally, but slightly greater on the right side, is seen The enlargement extends outward and backward on either side and is felt deep under the sterno-cleido-mastoid muscle

Operation, June 15, 1905, by Dr G E Beilby Cocaine Transverse Kocher incision The thyroid gland, with the exception of a portion of the upper part of the left lobe about 4x4 cm in extent, was removed without difficulty The right lobe is larger than the left and extends more deeply into the tissues

Patient made an excellent recovery In January, 1906, the patient's health was excellent

Pathology—Macroscopic Examination Specimen consists of a thyroid gland showing distinctly right, left and median lobes Weight 530 grammes Left and median lobes have been removed entire, a portion of right lobe is absent The left lobe measures 12.5x5x4 cm, the median 4x2 cm and the right 10x5x6 cm The mass is definitely encapsulated, of firm consistence, distinctly lobulated and of a dark red color The blood-vessels of the capsule are very large and tortuous The right and left lobes are somewhat symmetrical and more or less kidney-shaped, with flattening of the posterior surfaces The right lobe is of somewhat greater diameter antero-posteriorly than the left On section right lobe is seen to be grayish yellow in color and from the cut surface escapes a thick gelatinous material It is lobulated, the lobules being composed of numerous alveolar spaces the walls of which are formed of rather firm bands of connective tissue and in which is a colloid material of a clear translucent appearance Very many large blood-vessels are seen on section No cysts are present The left lobe is similar in all respects to the right

Microscopic Examination—Sections from four different portions of mass all show practically the same condition In general the structure is that of the normal thyroid gland The gland acini however, are greatly dilated and filled with a homogenous colloid material which stains with eosin These acini for the most

part are lined with a single layer of cuboidal epithelium. In many are blood-corpuscles and cholesterol crystals. The capsule of the gland is very delicate, and there is but a moderate amount of connective tissue throughout the gland substance.

Microscopic Diagnosis—Simple colloid hypertrophy

CASE II—(Path No 97-5) Female, aged 23, single. History of enlargement of the neck in the region of the thyroid for 13 years. The enlargement has gradually increased. Recently patient has complained of dyspnoea, dysphagia and nervousness. No exophthalmus.

Operation—November 15, 1897, by Dr Macdonald.

Pathology—Macroscopic Examination. Specimen consists of a lobulated mass of tissue of firm consistence, measuring 12x6x4 cm. It is divisible into two lateral lobes and a central portion, which probably represents the original thyroid gland. The surface is smooth for the most part, but in places, particularly posteriorly, is covered by vascular adhesions. The cut surface has a yellowish gray color, is irregularly divided into lobules, and is dotted here and there with cysts, containing a yellow, jelly-like material. This surface is smooth and glistening and covered with a translucent, sticky material. There are no signs of old or recent hæmorrhage into the gland substance.

Microscopic Examination—The tumor consists of tissue having in a general way the appearance of thyroid gland. It differs from this structure only in a marked increase in the size of many of the gland acini which contains a large amount of colloid material.

Microscopic Diagnosis—Simple colloid hypertrophy

CASE III—(Path No 05-996) Male, aged 60. History of goitre for 18 years which, though of large size, caused no symptoms until two months ago, when severe dyspnoea and dysphagia developed.

Operation—September 26, 1905, by Dr Elting.

Pathology—Macroscopic Examinations. Specimen consists of a flattened encapsulated dark red mass of tissue measuring 11x8x5 cm having the general appearance of an enlarged thyroid gland. One surface is irregular in form and is covered by fine adhesions, the other surface shows irregular lobulations separated one from another by deep fissures. The capsule contains a rich plexus of veins. Loosely attached to this mass is another

similarly encapsulated mass 6x3 5x2 5 cm which is pinkish red in color, lobulated and the seat of numerous small cysts. The surface is covered with fine adhesions. The cut surface of the larger mass shows a greatly thickened capsule surrounding well-marked lobules which have a smooth, glairy surface, and appear to be filled with colloid material. The smaller mass on section shows a similar capsule, paler in color and with smaller, less well-marked lobules, and numerous small cysts filled with yellow blood-stained fluid.

Microscopic Examination—Sections show structure of thyroid gland with capsule greatly thickened. The acini are greatly increased in size and number and filled with colloid. There is no increase in the interstitial substance or in the cells lining the acini.

Microscopic Diagnosis—Simple colloid hypertrophy.

These three cases illustrate very well this type of enlargement. It is characterized clinically by symmetrical increase in size, which is usually not rapid but extends often over many years. It is true that one lobe may be larger than the other, but the essential change is a diffuse involvement, and the term "simple goitre" or "simple hypertrophy" should be applied only to those lesions which thus involve the entire gland.

Histologically, the characteristic feature is a dilatation of the thyroid vesicles, the result of the increased colloid secretion. There is lack of uniformity in the size of the vesicles, but it is rare to observe any portion of the gland which shows normal vesicles. The connective-tissue stroma in the earlier cases is often found to be somewhat scant but definite lobulations can always be made out. After the condition has existed for a number of years secondary changes may produce a rather complex picture. These are most frequently hæmorrhage into the alveoli, with associated degeneration and pigmentation in focal areas. Infiltration of leucocytes and lymphoid and plasma-cells is not infrequent. The connective tissue in cases of long standing is usually very abundant. Calcification is common as a late degenerative change. Cysts of large size in a gland showing simple hypertrophy have not been observed. Minute smooth walled cysts formed evidently by

the rupture of the walls of adjacent vesicles, with fusion of their colloid contents, are commonly present

Etiology —It will be remembered that in the early embryonic thyroid colloid is not present in the epithelial vesicles. The colloid secretion makes its appearance at about the time of birth and first in small amounts, but with the advancing age of the child the individual vesicles show increased dilatation, the gland probably attaining its most active secretory stage during youth or early adult life. An enlargement of the thyroid at this period is very common, but it usually disappears at twenty-three to thirty years of age. This enlargement probably represents a simple hypertrophy of the organ. In explaining this condition of simple hypertrophy, then, it seems proper to infer that in a certain number of cases, instead of a subsidence of this physiologic hypertrophy, the process in an exaggerated form continues and a permanent hypertrophy is the result. In this series it is seen that while before twenty years of age only four cases came to operation, in six the age of onset was before twenty and in four others, in which the age of onset is stated, it was between twenty and thirty years, making nearly one-half of the recorded cases appearing either in youth or early adult life. Pregnancy in a few instances has apparently been the exciting cause.

In simple hypertrophy there is as a rule no symptoms except those produced by pressure upon the structures of the neck. Circulatory disturbances with extreme enlargement seem to be fairly common. Vertigo, which is frequently a symptom, is due, possibly, to pressure of the enlarged gland upon the blood-vessels of the neck. The duration of the condition varies greatly, for the patient seldom seeks advice until the pressure symptoms become severe. Mere deformity causes no concern, but when respiration or deglutition becomes difficult relief is sought. The periods of time represented in these cases vary from a few months to thirty-four years. The size to which the gland may attain also varies greatly. There seems to be no relation between the duration of the condition and the size

of the gland The case showing the most extensive hypertrophy in this series is Case I, quoted above

In the condition of simple hypertrophy, then, three things may occur First, there may be a subsidence of the active secretory process after puberty or during young adult life, and a diminution of the amount of colloid present with a return of the gland to its normal size These are the cases of moderate enlargement Second, the epithelium may cease to secrete colloid material after a certain age is reached, but fail to undergo retrogressive changes and the enlargement become a permanent one Instances of this nature are frequent The hypertrophy is of moderate degree causing as a rule no subjective symptoms, and but rarely demanding operation Third, a condition similar to No 2, in which in addition we see in later life, after a quiescence of many years, a rapid increase in the size of the already hypertrophied organ This enlargement is apparently due to two causes—an increase in the colloid secretion, as observed in the primary enlargement, and an actual reproduction (hyperplasia) of thyroid tissue This latter is apparently the process present in the majority of cases Only a portion of the gland may be secondarily affected The following case, which clinically was considered to be malignant, illustrates this type¹

CASE IV —(Path No 05-1114) Female, aged 53, goitre with slow growth for 17 years First began during pregnancy During the past seven months the enlargement has been rapid and confined chiefly to the left lobe Dyspnœa and dysphagia marked

Operation, October 25, 1905, by Dr Vander Veer Considerable difficulty was experienced in removing the gland, owing to its deep attachments

Pathology —Macroscopic Examination Usual appearance of old hypertrophic gland with increase of connective tissue, degeneration and calcification in areas, but in addition a large amount of comparatively normal thyroid tissue, differing perhaps in that it has a more cellular appearance

¹Under "Carcinoma" will be discussed the frequency with which hypertrophied glands of this nature undergo carcinomatous changes

Microscopic Examination—The sections show in general a simple hypertrophy with fairly large colloid vesicles lined by the usual epithelium. Here and there, however, are areas of small vesicles, some filled with cells and others containing a little colloid representing young thyroid tissue in various degrees of development. Small masses of epithelial cells are not infrequently observed outside of the colloid vesicle and probably represent focal zones of new thyroid tissue or compressed epithelial vesicles.

The histologic appearance in this case suggested the possibility of carcinoma. There is, however, no definite evidence of invasion of the old connective-tissue stroma by the new-formed thyroid tissue. This is a histologic picture frequently observed in cases of old simple hypertrophy in which there has occurred recent growth. Patient made a good recovery from the operation and was well six weeks later.

II—ADENOMA, 9 CASES

No	Age of onset	Age at operation	Duration
1		38	
2	16	21	5 yrs
3	37	55	18 "
4		24	
5	18	23	5 "
6	25	26	8 "
7	35	40	5 "
8	28	30	2 "
9		43	

Average age at onset, 26 years, average age at operation, 33 years, average duration, 7 years, female, 8, male, 1

CASE V—(Path No 755) Male, aged 55. Onset of tumor 18 years ago in the region of the thyroid. Has grown larger during the last two years. No symptoms except tumor.

Operation, September 26, 1904, by Dr Elting. Excision of tumor of left lobe. The right lobe and isthmus seemed normal.

Pathology—Macroscopic Examination. Specimen consists of an encapsulated tumor of the thyroid, measuring 8x6x3 cm. Tumor mass has been cut open. On section it presents a rough nodular surface mottled with dark red areas. Surrounding these

is a brownish yellow zone and still further out a deep red finely granular zone. The lighter areas are approximately 1x5 cm, the dark red areas measuring about 2x1 cm.

Microscopic Examination—There is distinct hyperplasia of both glandular and interstitial tissue, the glandular elements in places being massed together and compressed, with irregular outlines, in other places dilated and filled with colloid material, in still other areas the glandular elements are atrophied with marked increase of interstitial tissue, which is highly œdematous and hyaline.

Microscopic Diagnosis—Mixed adenoma of thyroid gland.

CASE VI—(Path No 05-1207) Female, aged 23. Tumor for 5 years. Rapid enlargement during the past eight months, dyspnoea. Tumor of the right lobe pushing the trachea and larynx to the left.

Operation, November 14, 1905, by Dr Elting.

Pathology—*Macroscopic Examination*. Specimen consists of a definitely encapsulated tumor 10x5x8x6 cm. Capsule is smooth and apparently free from adhesions. At one pole is a small irregular tumor. The capsule is very dense and fibrous. On section the tumor presents a uniform grayish appearance. Tissue is exceedingly soft and friable. No fibrous bands are seen. In the centre of the mass the tissue is disintegrated and there is found a small cavity filled with blood-stained colloid material. On section, the smaller tumor attached to one pole of the larger has the appearance of normal thyroid tissue and evidently represents the isthmus of the thyroid gland.

Microscopic Examination—(See Fig 1) The general structure of thyroid tissue can be seen, but there are no definite lobulations as are found in the normal and hypertrophied gland. The thyroid vesicles, however, are greatly enlarged and filled with a homogeneous colloid material which stains with eosin. In some areas the epithelium lining the individual vesicles has disappeared and their contained colloid has coalesced, forming large irregular pink-staining masses. Throughout the colloid material is seen isolated cells and clumps of cells which stain poorly and which represent the desquamated epithelium. There are also numerous red-blood cells. When an epithelial lining is present instead of a

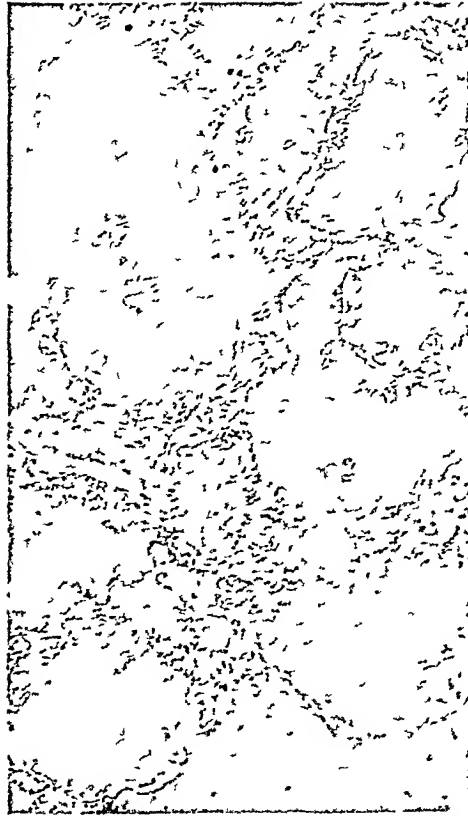


FIG 1—Microscopic drawing of a colloid adenoma, 4 oc 3 obj Lutz

The illustration shows that the thyroid vesicles are distended with a homogeneous colloid substance in which are clumps of epithelium and isolated epithelial cells

single layer of cells we see often several layers, and here the cells stain very poorly and have no definite arrangement. The connective-tissue stroma is very scant and the alveolar walls are delicate. There are a few small epithelial vesicles which contain no colloid and represent young thyroid tissue. The general picture is one of early degeneration.

Microscopic Diagnosis — Colloid adenoma of the thyroid

CASE VII — (Path No 64-5) Female, aged 26. Duration of illness 8 months. The prominent symptoms are pain, dyspnoea and dysphagia.

Operation, February 20, 1899, by Dr A. Vander Veer. No note on operation.

Pathology — Microscopic Examination. Specimen consists of a globular nodule measuring 4x3x1.5 cm. It is completely encapsulated. Its outer surface is covered here and there with torn adhesions which are attached to the capsule. The nodule is soft in consistence. On section the cut surface bulges somewhat, it is mostly of a grey-white color and rather translucent in appearance. Scattered through it are a few whiter areas suggestive of necrosis and one or two minute hæmorrhagic points.

Microscopic Examination — The section shows both the capsule and tumor substance. The capsule is composed of several layers of fibrous tissue, in the outermost layer of which can be seen compressed thyroid vesicles probably the result of the encroachment of the growth upon the normal gland-tissue. The tumor proper is made up of closely packed epithelial vesicles, which as a rule are empty or have only a cellular content. In this respect the tissue resembles that of the foetal thyroid, but differs in that the cells are of a higher type. In some of the vesicles, farthest from the periphery, there is a small amount of colloid present, this probably representing the oldest portion of the growth. The connective-tissue stroma is very scant and there are no lobulations visible.

Microscopic Diagnosis — Mixed adenoma of the thyroid gland

CASE VIII — (Path No 05-95) Female, aged 21 years, married. A tumor the size of a marble appeared in the region of the right lobe of the thyroid five years ago, two years after her last child was born, and has gradually increased in size since. Dyspnoea has been more marked of late.

Operation, January, 1905, by Dr Elting Ether "The patient took the anæsthetic very badly Resuscitation was necessary during the operation The tumor was removed through an incision along the anterior border of the right sternocleidomastoid muscle"

Pathology—Macroscopic Examination Specimen consists of an encapsulated tumor measuring 2.5x2x1.5 cm, enclosed in a yellowish white capsule On section it is fairly firm in consistence and presents a brownish white surface Very little connective-tissue stroma can be seen

Microscopic Examination—Section shows a thick fibrous capsule with normal appearing thyroid tissue in its outer layer The structure of thyroid gland can be made out, but the individual vesicles are small as a rule and contain no colloid In a few areas the vesicles are elongated and assume a tortuous tubular shape The connective tissue shows hyaline degeneration and œdema

Microscopic Diagnosis—Pure adenoma of the thyroid

Etiology—These adenomata comprise the solid non-malignant encapsulated tumors of the thyroid They may arise within the tissue of the thyroid gland, without and connected with its capsule, or at some distance from the gland They occur usually singly but in two instances in my series they occurred as multiple tumors of one lobe In one of these were present two smaller tumors, each about 3 cm in diameter, attached to either pole of a larger tumor 8x3x3 cm in size In the other a tumor of the left lobe 8x6x3 cm in size had attached to its capsule at one pole a small nodule about 2 cm in diameter, which macroscopically had the same appearance as the larger tumor

As to the location, five occurred within or apparently arose from the right lobe, two from the isthmus, and one from the left lobe, and in one instance the situation was not stated These tumors are in my experience usually of small size The largest was 10x8x6 cm and the smallest 3 cm The average diameter was about 5 or 6 cm

Clinically the adenomata are not as a rule difficult to recog-

nize They are hard and firm, freely movable, and generally present no symptoms except tumor By their pressure upon the trachea or œsophagus they may produce dyspnœa or dysphagia and in two instances the extreme nervousness of the patient was ascribed to such pressure The age of onset seems to correspond to that of adenomata in other glands of the body, occurring during youth or early adult life, when glandular activities are at their height The age of onset was generally between 16 and 35 years, five or over one-half between the twentieth and thirtieth years From the fact that these tumors produce no subjective symptoms, and that their growth is as a rule slow, it is often many years before the patient seeks surgical relief It is probable that these tumors are far more common than indicated by this series, for it is only when they produce pressure symptoms or cause considerable disfigurement that the advice of the surgeon is sought

No important etiologic factors, other than the age, can be determined In one case, the tumor appeared two weeks after confinement

There is nothing in the records to indicate that the thyroid gland in these cases was abnormal Where observations were made by the operator, it is noted that the gland appeared normal

Pathology—The adenomata are definitely encapsulated tumors, usually smooth, but occasionally somewhat nodular or lobulated The tumors vary considerably in consistence but are usually soft

Two distinct varieties may be recognized, depending upon the type of vesicle In the first, which we may designate as *pure adenoma*, the growth is found to be composed of closely-packed epithelial vesicles, containing little or no colloid and very small amount of connective tissue Many of the acini are seen to be filled with epithelial cells In the other variety, we have a condition in which histologically the picture very closely simulates that of simple hypertrophy These we may designate as *colloid adenomata* The epithelial vesicles are dilated and

filled with colloid material. There is usually but a single lining layer of epithelium.

An interesting feature of these tumors is their tendency to undergo various degenerative changes. The colloid adenoma resembles somewhat histologically the simple hypertrophy, but differs, however, in some important respects. Thus the stroma is less abundant, the walls of the vesicles are thinner, and the epithelial cells lining the vesicles in the hypertrophied organ are of a lower type than those in the colloid adenoma. To make a distinction between simple hypertrophy and adenoma is easy clinically and from a macroscopic examination of the specimen but upon histologic examination distinct differences in structure are not so evident.

Briefly stated, the main differences seem to be these:

(a) As to the epithelium lining the vesicles. In the adenoma we find the cell tending to a columnar character, while in the hypertrophy the cells appear more compressed and assume the appearance of a cuboidal type.

(b) As to the contents. Colloid. In the early adenoma, epithelial tissue is the one tissue present. Small amounts of colloid are visible, but this is not seen in appreciable amounts until a later stage. In this later stage the colloid is increased markedly in amount, and approaches as to quantity the amount which is visible in the hypertrophied gland. Besides this colloid material, which in certain amounts is normally present, the alveoli may also contain desquamated epithelium and red-blood cells. In the colloid adenoma there is usually present a large number of epithelial cells within the alveolus, which stands in marked contrast to the hypertrophy where no desquamation is evident. Again in the adenoma small hæmorrhages into the alveoli are more common.

(c) As to stroma. In the adenoma scarcely any connective-tissue stroma is visible, the vesicles with or without colloid material being closely packed together. In the hypertrophy, however, while a number of vesicles containing considerable colloid are in close proximity, being separated by small amounts

of connective tissue, the groups of vesicles are isolated and between these groups dense and rather large amounts of connective tissue are visible

Depending upon the secretory activity of the epithelial cells of the adenomata, a complex picture may be produced

First, All of the epithelial cells may begin to secrete actively, and varying amounts of colloid may appear within the alveolus, producing the *colloid adenoma*

Second, All the epithelial cells may fail to secrete, and then we have a type of gland in which no colloid material is visible, resembling in many respects the type of tumor described as *fœtal adenoma* but differing in that the vesicle is not solid,—*i e*, made up of several layers of epithelial cells, but is merely an alveolus lined by a single layer of cells in which no colloid material is evident

Third, A number of the cells may remain dormant while the remainder are secreting colloid material, thus presenting the picture which many authors describe as *mixed adenoma*

Cyst Formations—Here I wish to emphasize the fact that undoubtedly a large percentage of cysts of the thyroid have their origin in adenomata. Very frequently we find in the walls of cysts thyroid tissue resembling simple hypertrophy. Cyst formations however in thyroids that have undergone simple hypertrophy is an extremely rare occurrence. None of the cases reported in this series show aught but minute cysts formed by the rupture of the walls of a few adjacent vesicles and the coalescence of their contained colloid. The adenomata, however, appear very prone to undergo degeneration with the formation of cysts. In Case VI it was seen that the tumor presented distinct evidences at its centre of beginning cystic formation

III—RECURRENT ADENOMA THREE CASES—MALE 2, FEMALE 1

The adenomata, as has been shown in the preceding section, occur singly as a rule and do not present histologically or clinically signs of malignancy. We have, however, three

cases in which there has been either recurrence at the site of operation or a subsequent appearance of a similar tumor in other portions of the gland. These were clinically considered to be malignant, and the microscopic study revealed a more or less atypical growth of epithelium.

CASE IX—(Path Nos 97-3 and 64-19) Male, aged 49. Thyroid tumor appeared twenty years ago and gradually increased in size up to five years ago, causing dyspnoea and dysphagia.

Operation, February 6, 1897, by Dr Macdonald. Removal of tumor. Five months later a similar tumor appeared in the isthmus and gradually increased in size for four and a-half years, and now presents as a firm apparently encapsulated tumor in median line of neck about 4x6 cm in size. The lateral lobes of the thyroid show slight enlargement. The surgeon, Dr Macdonald, considered the growth to be malignant and the entire gland was therefore removed.

Pathology—(First operation) *Macroscopic Examination*. Specimen consists of a portion of the thyroid gland measuring 9x6 cm. The outer surface presents a mottled appearance, the prevailing color being red, with here and there small areas of discoloration due to hæmorrhage. The surface vessels are distended. On section the specimen shows a large empty cyst, the walls of which are thin and covered by gelatinous substance, probably colloid material. Other cysts are seen of smaller size than the one just described. They are filled with a colloid material and in some are small pea-sized hæmorrhages. Portions of the growth have undergone calcareous degeneration.

Microscopic Examination—No definite capsule is seen. The tumor proper is made up of tissue of the same general type as that of the normal thyroid but which shows greater irregularity in the gland acini. The connective-tissue network is moderately augmented, this is evident in the size of its strands. Irregularly distributed throughout the specimen are collections of epithelial cells of the same appearance as those constituting the normal gland structure. The gland spaces are for the most part smaller than normal, though here and there dilated spaces may be seen. All alveoli contain homogeneous pink-staining material, presumably colloid, in a few hæmorrhage has occurred. There is marked hyperplasia of the epithelial cells.

Microscopic Diagnosis—Adenomatous cyst of the thyroid

Second Operation—(Path No 64-19) Macroscopic Examination Specimen consists of six pieces of tissue which are evidently from the thyroid gland The largest portion measures 7x8x4 cm Its outer surface presents a somewhat lobulated appearance and is covered with a smooth membrane to which are attached a few fibrous adhesions Beneath the membrane the color of the tissue is a light red On section the tissue is of fairly firm consistence, but varies somewhat in character in the different portions In some places it presents a semi-translucent grayish white appearance, in others it is darker in color and somewhat more opaque Considerable portions of the specimen are made up of colloid material Here and there are definite calcareous deposits In one of the smaller portions which measures 7x4x2 cm the tissue resembles that already described except that an area about 3.5 cm in diameter is definitely hæmorrhagic The remaining pieces which compose the specimen are similar in structure to the portions described

Microscopic Examination—We have here the same general type of tissue seen in the tumor removed five years previously Some of the gland acini are greatly enlarged and filled with colloid material, others are small and have only a cellular content The epithelium approaches the columnar type and in many places shows no typical arrangement

Microscopic Diagnosis—Adenoma of thyroid

In this case the specimen first removed (97-3) is a cyst which has apparently arisen by degeneration of an adenoma, while the second growth (64-19) presenting the same characteristics clinically, was an adenoma The significance of this in relation to cysts will be discussed under that heading

CASE X—(Path No 64-26) Female, aged 45 Tumor of right lobe which first appeared seventeen years ago (1888) After five years it reached the size of a lemon and was removed September, 1893, no pathologic study was made Four years after first operation (1897) a similar tumor appeared in the left lobe and was removed six years later (Sept 21, 1903), by Dr Macdonald This tumor the patient states seemed exactly similar

to the first one Both finally produced pressure symptoms upon the trachea and œsophagus, and for relief of these symptoms patient sought operation With the second tumor there was considerable pain, and dyspnœa and dysphagia were more pronounced The description of this tumor follows

Pathology—Macroscopic Examination Specimen consists of a portion of thyroid gland measuring approximately 11x4.5x3.5 cm Beneath the capsule except in a small portion of the end of the tumor can be seen numerous pea to cherry-sized cysts In the centre of the specimen can be felt a hard stone-like mass the size of a cherry On section all but a small area at one end of the specimen is seen to be filled with various sized cysts containing a clear colloid material The wall of one of the larger cysts is completely calcified and measure 2 mm in thickness

Microscopic Examination—The gland alveoli are numerous and for the most part distended by homogeneous colloid material Some contain also desquamated cells and leucocytes many of which are loaded with pigment The alveoli surrounding the more distended alveoli are small and arranged concentrically Other areas show small irregularly developed alveoli Several are irregular and without any distinct limiting wall and contain a bluish pink mucoid-like material, blood pigment and elongated connective-tissue nuclei The intervalvolar tissue shows hyaline degeneration in places

Microscopic Diagnosis—Adenoma with hæmorrhage and calcification and a tendency to an atypical growth of the epithelium

About two months ago, two years after the second operation, a tumor appeared in median line of the neck and has slowly increased in size This tumor is clinically an adenoma There is no evidence of recurrence at the sites of previous operations Patient's general health is excellent The patient is considering an operation

CASE XI—(Path No 97-2) Male, aged 60 Tumor removed from the region of the right lobe of the thyroid by Dr Macdonald nine years ago

Pathology—Macroscopic Examination Specimen consists of a mass almost the exact size and shape of a kidney The surface is irregular and in places it is covered by a distinct capsule

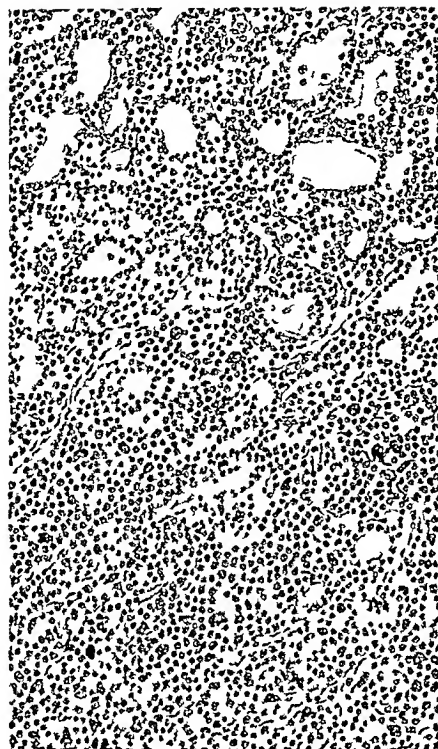


FIG 2—Microscopic drawing of a recurrent adenoma 4 oc 3 obj. Leitz

The upper portion of the drawing shows tissue containing a few apparently normal thyroid vesicles. The lower portion shows tissue in which no normal vesicles are present, but composed of epithelial cells, having no typical arrangement and in a few of which a large irregular and deep staining nucleus is seen.

which is somewhat hæmorrhagic. In other places patches of connective tissue containing large blood-vessels lie on the surface. It is somewhat lobulated and of a brownish yellow color. On section at one point is seen a cyst-like cavity containing a friable grumous material of a yellowish color, slightly viscid and apparently cell-detritus. The remainder of the tumor can be divided into a cortical and medullary portion. The cortical portion averages about 1.5 cm. in width and is distinguished from the medullary by its light color and more or less radial striation due to the presence in its substance of fine bands of connective tissue. The medullary substance is distinctly pinker in color than the cortical, and the bands of connective tissue which traverse it have no distinct or regular distribution. The consistence of the tumor as a whole is firm, the cortical substance perhaps being a little firmer. Distinct areas of calcification are present.

Microscopic Examination—(See Fig. II.) Sections show the tumor to consist of a capsule and tumor substance. The capsule is for the most part made up of fibrous tissue. Here and there, however, it contains small collections of cells of the same type as the gland-cells, and it is evidently formed of compressed gland substance. The tumor itself is composed of a tissue of the same general type as normal thyroid tissue. It differs in the greater irregularity and shape of the gland acini. Near the capsule the connective-tissue network often runs in parallel striæ passing from the capsule into the depths. In the deeper parts of the tumor this cannot be made out. The colloid material in one or two places has undergone calcification.

Microscopic Diagnosis—Adenoma of the thyroid.

Recurrence in same location after seven years. This second growth was an encapsulated tumor which had reached the size of a hen's egg. Specimen not saved for pathologic study.

A year after the removal of the second growth (April, 1903) there was again a recurrence which soon reached considerable size. On consulting a surgeon at this time the process was considered malignant and operation not advised. From this time until January, 1906, about one and one-half years, when patient was last seen, there has been constant increase in the size of the primary growth, which now measures 7x6 cm. in size. It is located in the right lobe of the thyroid and extends apparently

deep into the neck Near the upper pole of this tumor there is a second mass, which made its appearance about one year ago This is entirely distinct from the older tumor, is superficial, and has no deep attachments It is ovoid in shape, 5x4 cm in size, and moves about freely underneath skin, which is nowhere adherent over either tumor Patient has thus far refused operation

We have then in this case a thyroid tumor which has returned twice after removal, the condition extending in all over a period of nine years, and in which there has developed now in the region of the recurrent tumor a secondary growth The patient is still in fair general health but suffers from the effects of pressure The question of carcinoma arises The long duration would almost exclude this possibility The growth, while of large size, is as far as can be determined, encapsulated, and affects the health of the patient only by its mechanical presence Histologically, the first growth removed can be characterized only as an adenoma, though it does present an unusual picture, similar to that in the other two cases described in this group An interesting feature is that in all of these cases the patients are now over 40 years of age In one the onset of the first growth was at 51 and in the other two, one at 29 and the other at 32 years of age, thus differing from the usual history of adenoma

IV—CYSTS 12 CASES

No	Age of onset	Age at operation	Duration
1	10	16	6 yrs
2	21	26	5 "
3		27	
4	17	26	9 "
5	38	42	10 "
6	33	41	8 "
7	36	43	7 "
8	15	24	9 "
9	25	33	8 "
10	19	20	18 mos
11	49	49	4 "
12	39	43	4 yrs

Average age of onset, 27 years and 6 months, average age at operation 32 years and six months, average duration of disease, 6 years, females 7, males 3, sex not stated 2

We recognize three main types of thyroid cysts, *simple*, *hæmorrhagic*, and *adenomatous cysts*¹

Simple Cysts Three cases

CASE XII—(Path No 06-197) Male, aged 16 years
When six years of age his parents noticed a small lump about the size of a hickory-nut in the region of the left lobe of the thyroid. This increased very little in size until four years ago, since which time there has been slow but gradual enlargement. There is no exophthalmus or tremor, but the boy is of a nervous disposition.

Operation, January 22, 1905, by Dr. Beilby. Anæsthetic, cocaine. In the region of the left lobe of the thyroid is found a smooth, ovoid tumor about 5x9 cm with its larger diameter extending from the thyroid cartilage towards the ear. No lobulations can be made out. The tumor is very tense and no definite fluctuation can be determined. It is attached to the larynx and moves up and down perceptibly on swallowing. The cyst was excised without rupture. The thyroid tissue about the cyst appears normal.

Pathology—Macroscopic Examination. Specimen consists of a cyst of the thyroid gland measuring about 6x9 cm in size. Its outer surface is smooth and only at one pole can thyroid tissue be seen. On opening the cyst the walls are found to be very thick and fibrous. The contents of the cyst is a brownish translucent fluid with numerous oil-globules floating about in it. The inner surface of the cyst-wall is very white and fibrous and is covered with many flakes of fibrin and some atheromatous patches. One small area of thyroid tissue 1x1.5 cm projects from the inner wall of the cyst.

Microscopic Examination—Cyst-wall: outer layer of loose fibrous connective tissue with blood-vessels and a very cellular central zone. At first glance these cells look like lymphoid cells, but the presence here and there of small amounts of colloid material leads to the conclusion that they represent greatly compressed thyroid vesicles with atrophied epithelium. The next

¹In addition to these, occur the small multiple cysts found with great frequency in the simple hypertrophic gland. They never attain any great size and are undoubtedly caused by the coalescence of two or more distended vesicles with fusion of their colloid contents. Clinically, they never produce any symptoms and are only of pathologic interest.

layer is the inner wall of the cyst, which is composed of loose lamellæ of tissue and masses of blood-corpuscles, suggesting an organized blood clot

Microscopic Diagnosis—Simple cyst of thyroid

At present, one year after operation, patient is perfectly well

This is the type of a thin-walled cyst. They occur in glands that are apparently normal. The cyst-wall is composed of compressed thyroid tissue. The inner wall is usually smooth and fibrous but may be lined with a mass of epithelial cells. The contents is usually fluid but varies both in color and consistence, the color depending on the amount of blood and the consistence on the admixture of colloid.

Hæmorrhagic Cysts. One case

The following case, illustrating this type, is perhaps almost unique

CASE XIII—(Path No 195) Male, aged 41. Eight years ago patient fell backward down stairs. Noticed at once, following the fall, a swelling in the region of the right lobe of the thyroid gland. This increased in size but little until a few days previous to operation, when a rapid enlargement occurred. This was accompanied by a constant dull pain for which the patient sought advice.

Operation, March 16, 1904, by Dr Elting. Nitrous oxide and ether. Excision of the right lobe of the thyroid. 50 c c of brownish fluid was evacuated from the cyst during its removal.

Pathology—Macroscopic Examination. Specimen consists of an encapsulated mass, evidently comprising the entire right lobe of the thyroid gland. It measures 10x5x4 cm. On section a large cavity is found from which was evacuated 50 c c of reddish brown fluid containing necrotic tissue. The necrotic material is both free in the cavity and adherent to the walls of the cyst. Here and there in the walls are found calcified areas, none larger than 5 mm in diameter. The wall of the cyst averages about 5 or 6 mm in thickness.

Microscopic Examination—Sections show the cyst-wall to be composed of thyroid tissue, in general fibrous, but in some areas quite normal. There are areas of hæmorrhage and necrosis. In

these areas and surrounding them is an extensive infiltration with polynuclear leucocytes, though in general the tissue is infiltrated with lymphoid—and plasma-cells. The picture everywhere presented is that of chronic inflammation with tissue degeneration and focal areas of necrosis. The type of thyroid vesicle where it can be made out is that of the normal gland.

Microscopic Diagnosis—Hæmorrhagic cyst with chronic thyroiditis, hæmorrhage and necrosis.

Hæmorrhage has always been assigned as an important factor in the production of thyroid cysts. The presence of hæmorrhage, recent or old, in cyst contents or its walls is an almost constant observation. It seems probable however that this is much more commonly a secondary process than the true etiologic factor. That a primary hæmorrhage, produced either by violent trauma, or the rupture of a small blood-vessel from any cause within the substance of the thyroid gland, is capable of producing later a cyst there can be no doubt.

Adenomatous Cysts Ten cases

That the adenomata play such an important rôle in the production of cysts seems not to have been generally recognized. In this series, 70 per cent, or 10 of the 14 cases, present evidence of having arisen from this type of tumor.

CASE XIV —(Path No 05-010) Female, aged 26. Tumor of neck nine years, gradual increase in size, more rapid during the last year. Dyspnoea and tachycardia on exertion. Pulse constantly 104-106. Marked harshness of voice. Complains of headache and pain in right ear. Tumor is situated in median line and moves with deglutition.

Operation, July 17, 1905, by Dr. Beilby. Cocaine. Transverse incision. Excision of cyst of isthmus. The remainder of the thyroid gland appeared normal.

Pathology—Macroscopic Examination. Specimen consists of a thick walled cyst of the thyroid which was removed at operation without rupture. It is nearly globular in shape but slightly flattened in its antero-posterior diameter. It measures 7.5x5.5 cm. Its capsule is of a pink color, very delicate and easily torn. The blood-vessels are large and tortuous. It is rather soft and

fluctuant On section it is found to contain a brownish bloody fluid This cavity is approximately 4.5x3 cm in size The wall of this cyst measures from 5 to 15 mm in thickness and seems for the most part to be composed of apparently normal thyroid tissue There are some areas, however, which resemble glandular hyperplasia Again other areas show hæmorrhage and necrosis Blood-vessels are large and numerous

Microscopic Examination —Section through cyst-wall shows a thick capsule, which has apparently been formed by compression of thyroid tissue Scattered throughout are many normal thyroid cells and in some areas are acini filled with colloid material and lined with cuboidal epithelium From this capsule strands of connective tissue extend to the deeper portion of the cyst wall and form a definite connective-tissue framework, presenting somewhat the histologic structure of thyroid acini These spaces, however, are packed with what are apparently desquamated epithelial cells A few normal acini are noticed, which are filled with colloid material Other sections show in addition free masses of red-blood corpuscles, and marked hyaline degeneration of the connective tissue

Microscopic Diagnosis —Cyst in a *mixed adenoma*

At present, eight months after operation, the patient is in excellent health The huskiness of her voice has largely disappeared, her pulse rate has dropped ten to twelve beats per minute, and she is not so nervous as before operation

CASE XV —(Path No 64-23) Female, aged 26 Has had a tumor in the right side of the neck in the region of the thyroid for five years Tumor first appeared during first pregnancy There has been a gradual slow increase in size up to three years ago, when after the birth of her second child the growth became more rapid

Pathology —Macroscopic Examination Specimen consists of a globular cystic mass 5x3.3x2.5 cm, the outer surface of which is smooth and encapsulated On section the cyst contents are found to consist of a brownish fluid The cyst wall is smooth The cyst originates in the thyroid gland, and to its outer surface fragments of normal thyroid-tissue are adherent

Microscopic Examination —The capsule is composed apparently of compressed thyroid alveoli Within the capsule proper

the tissue has the structure of thyroid and very slightly approaches the characteristic foetal type of gland No colloid is visible

Microscopic Diagnosis—Cyst in a pure adenoma

CASE XVI—(Path No 97-4) Female, aged 20, has had a tumor in the region of the isthmus of the thyroid for eighteen months

Operation, October 19, 1897, by Dr A Vander Veer

Pathology—Macroscopic Examination Specimen consists of an oval piece of tissue 4.5x3.5x2.5 cm It is for the most part cystic, the cystic contents having been removed, leaving a cavity which occupies about two-thirds of the tumor, the upper third consisting of a solid mass of tissue The outer surface of the tumor is moderately smooth, but here and there are the remains of adhesions The cyst-cavity is the size of a walnut and its walls are thin, averaging about 1 mm in thickness The inner surface is very irregular, and is traversed here and there by raised bands The color varies from pinkish to grayish white Secondary cysts varying from those the size of a pin-head to those the size of a pea can be made out in the walls They contain a mucilaginous yellowish brown fluid In places on the inner surface of the cavity are areas of calcareous deposit The solid portion of the tumor is only moderately firm in consistency and measures 2x1 cm Its cut surface is of a yellowish gelatinous appearance It contains a number of small cysts filled with fluid, which varies in color from a light to a dark brown

Microscopic Examination—The tumor on section presents varying appearances In some places it has the ordinary appearance of thyroid gland structures, being made up of cavities of various sizes, containing colloid material, between which are cellular bands of tissue This appearance is confined particularly to the portion of the tumor furthest removed from the cyst cavity The walls of the cyst-cavity are made up, for the most part, of a firm solid tissue, composed of a basement substance containing numerous epithelial and spindle shaped cells In this substance are to be seen the compressed remains of the thyroid alveoli and also a very large number of cells containing a yellowish brown pigment, evidently changed blood-pigment At one point are present in the tumor a number of wedge-shaped spaces, the walls of which are formed by the tumor-tissue In these are occasional spaces

representing a deposit of crystals, presumably cholesterol. The cells about these spaces are multinucleated, apparently foreign-body giant-cells.

Microscopic Diagnosis—Cyst in a colloid adenoma

It will be recalled that in discussing the adenomata we recognized two types of thyroid vesicles,—one large and containing colloid, and the other smaller in which no colloid was visible, also a third variety, combining the characteristics of these two. In the walls of these cysts we find a histologic structure which exactly corresponds to one or the other of these types. As we might perhaps expect, the colloid adenoma is the variety which most frequently undergoes cystic degeneration. Five, or one-half, of the cysts in this series were of this type. In only one could no colloid be seen in the tissue of the cyst-wall. Four were of the mixed variety. Aside from the histologic evidence of the production of cysts from solid adenomata, we have in certain of the cases a gross appearance indicating beyond doubt that the tumor was originally an adenoma and that degeneration has taken place with a resulting cyst formation. Of importance in this connection is the observation of cholesterol crystals indicating fatty transformation of the epithelial elements. If the process is an early one the cysts may be only of small size and the structure of the adenoma still be retained.

As the degeneration advances and the fluid contents of the cyst is increased in amount, there is compression of the alveoli and later many of the cells may atrophy and the stroma undergo various forms of degeneration, giving widely varying and very complex pictures. The inner layer of the cyst may then be said to be composed of the remains of the adenomatous tissue, while the wall proper represents the fibrous capsule of the original adenoma, and the outer layer, the stroma and compressed alveoli of the surrounding thyroid-tissue. With the enlargement of the cyst and its encroachment upon the surrounding normal thyroid-tissue we often get a lamellated appearance. These lamella are as the result of the successive

compressions of the normal gland-tissue, with subsequent atrophy of the epithelial structures, leaving only the stroma and alveolar walls. Thus fibrous bands of varying thickness appear. Between these layers are often seen normal thyroid vesicles, and vesicles in various stages of atrophy.

The histogenesis of these cysts may be said to be as follows. In the beginning we have an encapsulated adenoma composed of cells which present no colloid secretion. As the growth continues colloid material is secreted and a coalescence of these colloid vesicles in the centre of the tumor to be seen. Hæmorrhage occurs and we have a cystic cavity filled with bloody colloid material. The fibrous capsule of the original adenoma forms the wall of the newly-formed cyst. As the degenerative process continues and the contents of the cyst increases the tumor necessarily becomes larger and pressure is exerted on the surrounding normal tissue, causing atrophy of apparently normal vesicles. As in long continued degenerative processes occurring in other tissues, lime salts may eventually be deposited in the wall of the cyst giving extensive calcified areas.

V—ABERRANT OR METASTATIC THYROID TUMORS WHICH ARE HISTOLOGICALLY BENIGN BUT CLINICALLY MALIGNANT ONE CASE

CASE XVII—(Path No 88-68) Male, aged 65 years. Family and past history not important. Six months ago first noticed a fulness of right side of face and difficulty in breathing through right nostril. Tumor has increased in size rapidly and has been accompanied by considerable pain. At present there is complete occlusion of the right nostril and bulging of right eyeball with inflammation of conjunctiva, and obstruction of tear duct. At the operation by Dr. Vander Veer the antrum of Highmore was opened but only a small portion of the growth was removed. Its extensive character made a complete removal impossible. The clinical diagnosis was sarcoma of antrum.

Pathology—Macroscopic Examination. Specimen consists of an irregular mass of tissue removed from the upper jaw. There are one or two pieces of bone, the remainder of the tissue being

of a grayish white color and having the appearance of granulation tissue

Microscopic Examination—The sections indicate that the tissue is that of the thyroid. Two definite pictures are presented. First, large alveoli filled with colloid, lined usually by a single layer of cubical epithelium, and containing throughout the colloid substance many desquamated epithelial cells which take the stain rather poorly. Second, areas showing epithelial hyperplasia but less tendency to colloid secretion, giving the tissue a more solid cellular appearance. On careful examination of these cellular areas they are found to be composed of closely packed thyroid vesicles, some of fair size but filled with cells which approach a columnar type. Hæmorrhages into the alveoli are frequent. Connective tissue stroma is very scant. The tissue shows signs of inflammation in places, containing a number of polynuclear leucocytes.

Microscopic Diagnosis—Aberrant or metastatic thyroid tumor.

For the further history of the case I am indebted to Dr Merritt, of Cherry Valley, who writes me that the growth increased very rapidly after the patient left the hospital and finally involved the right eye. The bony structures he thinks were extensively involved as some of the teeth and a portion of the superior maxilla were lost during the course of the disease. To the best of the doctor's recollection and that of the patient's friends, there was no hypertrophy or tumor of the thyroid gland, either previous or subsequent to operation.

To establish a positive diagnosis of *metastatic adenoma of the thyroid*, we must necessarily have at least clinical evidence that a primary adenoma existed in the thyroid gland. This evidence is wanting. If such an adenoma existed it was so small as to escape notice. Whether or not such a primary tumor existed the case is of equal interest.

There are now in the literature records of about 20 cases of tumors apparently metastases from the thyroid, which were histologically benign. As in a number of these instances there has been no apparent primary thyroid lesion, these cases have

been considered as *metastases from normal thyroid tissue*. Where a thyroid lesion has been observed it has been that of simple hypertrophy or adenoma, and the metastatic tumor has had a similar histologic structure. These metastases, which may be single or multiple, have occurred most frequently in bone and have often been removed under the supposition that they were primary growths. Aside from the fact that these tumors are probably of metastatic origin they present as a rule no other indication of malignancy. Frequently, however, they have been known to recur after removal and a number of cases have thus resulted fatally. Therefore the important question arises, are not these tumors malignant and should they not always be considered as such by the surgeon?

In the case I report the tumor presented clinically every indication of malignancy. Its invasion of tissue was rapid and death was caused in eight months after its onset. As there never was observed any hypertrophy or tumor of the thyroid gland, we can only assume that if this was a metastatic tumor the metastasis was from normal thyroid tissue. As will be noted, however, in the microscopic study, the growth was histologically a thyroid adenoma and of the type we have described as mixed adenoma.

In the case reported by Oderfeld and Steinhaus¹ the first tumor observed was in the frontal bone. This was removed and histologically found to have the structure of normal thyroid. The patient was again seen after an interval of six months, but no recurrence was evident. After about a year there was a recurrence and also other similar tumors made their appearance, one in the temporal region and one at the sterno-clavicular articulation. Clinically these tumors were considered to be malignant. At the request of the patient the one in the temporal region was removed. This presented a similar structure to the one removed from the forehead one year before. The patient died a few weeks later. Before death a thickening of the under half of the right lobe of the

¹Centralb f allg Path u path Anat, 1903, xiv, 84

thyroid was noted. A complete autopsy was not permitted, but all visible tumors were removed together with the thyroid gland. Within the substance of the right lobe of the thyroid was found a small nodular thickening 2 cm. in diameter. The remainder of the thyroid appeared normal. The tissues were all carefully sectioned and examined, the authors expecting to find carcinomatous degeneration, but the structure throughout the tumor of the thyroid and the other isolated tumors of the head and neck were uniformly the same and as they observe had the exact structure of normal thyroid tissue. They regard the small thyroid nodule as the primary tumor and the tumors of the head and neck as metastases.

Etiology—The fact that we have in these metastatic tumors structures similar or almost identical to the tissue found in the normal gland lends special interest in the etiology of these tumors. In its consideration several factors may be taken into account.

First, Origin from *misplaced embryonal tissue*. The theory which has been advanced by Conheim in which he regards the etiology of malignant growths as due to misplaced embryonal cells might be applied to tumors of this class.

Second, Origin from *aberrant or accessory thyroid*. Murphy in a recent article² calls special attention to a group of accessory thyroid glands which he frequently finds at the base of the tongue and which he classified as the superior group. He records 39 cases. In only three is there a note upon the histology of the tumor. Two presented the appearance of "normal thyroid," and one of "colloid goitre." In six, or 15 per cent of the cases there was recurrence after removal but no other signs of malignancy.

Third, *Propagation of bits of thyroid tissue through the circulatory system*. It is a well-known fact that certain tissues, especially young embryonal cartilage, when transplanted into different tissues of the body or when injected into the circulatory apparatus are apparently nourished and in certain

² Jour. of the Amer. Med. Assoc., 1905, xlv, 1854

instances continue to grow. An apparently analogous condition is true in regard to the thyroid-gland tissue. Portions of this gland have been excised and immediately transplanted into another animal of a foreign species. The tissue not only has remained alive but has apparently continued to produce its normal secretion. Although no proof is at hand, it is possible that these metastatic tumors could result from small particles of thyroid tissues which had found their way into the circulatory apparatus and had been transferred to distant portions of the body. In an organ as vascular as the thyroid such a condition is not inconceivable especially under conditions of trauma.

As is well known metastases from tumors of the thyroid, like those of the prostate, occur most commonly in bony structures.

VI—EXOPHTHALMIC HYPERTROPHY SIX CASES ALL FEMALES

No	Age of onset	Age at operation	Duration
1	28	29	16 mos
2	25	26	1 yr
3	20	21	1 "
4	24	27	3 "
5	28	43	15 "
6	44	46	2 "

Average age of onset, 28, average age at operation, 32, average duration of disease, 3 years and 10 months

Result—In two cases death occurred, one (case No 3) on the table at the end of operation as a result of the anæsthetic, the other (case No 2) died seven days after operation, with the symptoms of extreme hyperthyroidization. The remaining four cases have been either entirely cured or greatly benefited by the operation. Case No 1, four years after operation, is well and all the symptoms have been relieved except slight prominence of the eyes which remains. The portion of the gland that was left at operation is now distinctly palpable.

Case No 4, one year and two months after operation the symptoms are all relieved and the patient is able to pursue his work Before operation exophthalmos, tachycardia and nervousness were marked Case No 5 is well ten months after operation Case No 6 operation was done but one month ago The condition of the patient is improved

CASE XVIII —(Path No 64-25) Female, married, aged 26 Complains of enlargement of neck, poor sight and some difficulty in breathing Onset one year ago, first symptom enlargement, followed by exophthalmus Thyroid gland now presents symmetrical enlargement, exophthalmus very pronounced, marked tremor of hands Systolic murmur heard over base of heart, not transmitted Heart not enlarged Pulse 140

Operation, June 24, 1903, by Dr A Vander Veer Ether anaesthesia Both right and left lobes were removed For three or four days after operation the pulse ranged between 130 and 158, temperature between 100 and 102 F Delirious at intervals Death on the seventh day

Pathology —The gross description merely contains the statement that the specimen consisted of two masses of glandular tissue, one measuring 8x4x2 cm and the other 5x4x1 5 cm

Microscopic Examination —(See Fig, 3) Sections 1, 2 and 3 all show the lobulated structure of the thyroid gland There is an increase in the interlobular connective tissue The vesicles composing the lobules are very irregular in size and shape The colloid material in many of the vesicles has been entirely replaced by epithelial cells Instead of a single layer of epithelium lining the individual vesicles, we see a number of layers, this proliferation of cells often producing invaginations or papillary projections into the cavity of the vesicle In certain areas this proliferation of cells has advanced to such an extent as to completely fill the vesicle and we have entire lobules presenting a solid cellular structure The cells are of a high columnar type There is lymphocytic infiltration in areas

Microscopic Diagnosis —Advanced and diffuse exophthalmic hypertrophy

CASE XIX —(Path No 763) Female, single, aged 21 Enlargement of thyroid for one year, more marked on right



FIG 3—Microscopic drawing of an exophthalmic hypertrophy (exophthalmic goitre),
4 oc 3 obj Leitz

In this drawing the hypertrophy is indicated by the proliferation of the epithelial cells lining the vesicles and the papillary projections into their lumen. In places some of the vesicles have been compressed by the hypertrophy of the surrounding epithelium.

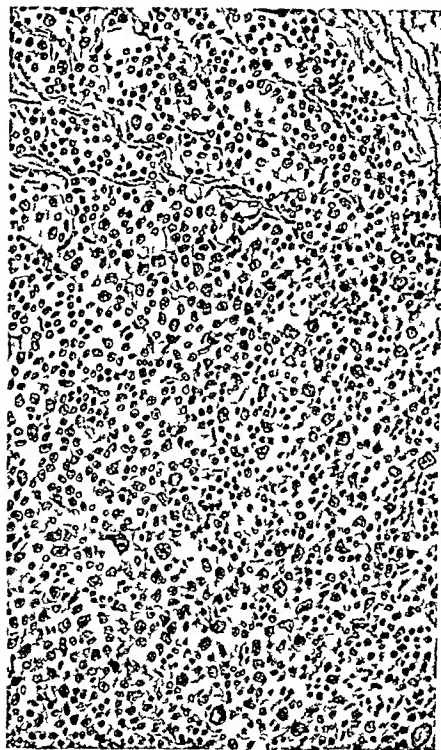


FIG 4—Microscopic drawing of a section of thyroid which presents in other areas a definite picture of exophthalmic hypertrophy 4 oc 3 obj Leitz
(See microscopic description)

side Exophthalmus, tremor and tachycardia pronounced As patient steadily grew worse under medical treatment, operation was advised

Operation, September 28, 1904, by Dr Elting Ether anæsthesia Excision of right lobe and isthmus Left lobe not removed The patient died on the table at the end of operation

Pathology—Macroscopic Examination Specimen consists of two pieces of tissue, measuring respectively 6x4.5x3 cm and 3x2.5x2 cm in size Both are of similar structure The larger is somewhat lobulated and is encapsulated except on one surface, near the upper pole, where there is a raw granular surface corresponding in diameter to the smaller piece Both masses are more or less nodular and on section have a pinkish white granular appearance There are several cysts 0.5 to 1 cm in diameter containing straw-colored grumous fluid The surface presents rather round or oval areas, each being somewhat distinct from the other

Microscopic Examination—The sections present an unusual picture for exophthalmic hypertrophy They have in general a definite lobulated glandular appearance In many lobules the proliferation of epithelial cells has progressed to such an extent as to entirely obliterate the characteristic thyroid gland structure, giving solid epithelial masses The walls of the individual vesicles have disappeared, evidently as a result of pressure In one such area (see Fig 4) there is in addition an unusual change in the cell morphology As seen in the microscopic drawing, the cells are very large and irregular in shape and in this regard suggest very strongly malignant transformation In one section, evidently representing the wall of the small cyst mentioned above, the hypertrophy is not so far advanced and hyperplasia of the cells with papillary projection or invagination of the epithelial layers into the cavity of the vesicle is seen, representing more the picture we recognize as that of exophthalmic hypertrophy The colloid material except in a few places has disappeared In the study of these sections one is impressed with the possibility of the association of exophthalmic hypertrophy and carcinoma

CASE XX—(Path No 05-1376) Female, single, aged 46 For six years headache, extreme nervousness and dizziness at

irregular intervals Two years ago onset of exophthalmus, tachycardia and tremor Four months later observed enlargement of thyroid gland This enlargement is symmetrical and well marked

Note on physical examination—Patient is a rather slightly built woman, rather poorly nourished and anæmic Areas of discoloration of skin on left cheek and backs of both hands Exophthalmus definite but not of an extreme degree Sight has failed rapidly Pulse regular, of even tension, 96 per minute On admission to hospital it is recorded as 90 Thyroid gland shows a nearly symmetrical enlargement, left lobe a little larger than the right, measuring about 8.5x5 cm and is moderately firm

Operation, December 29, 1905, by Dr Elting Ether, excision of left lobe and isthmus

Pathology—Macroscopic Examination Specimen consists of what is apparently the left lobe and a portion of the isthmus of the thyroid gland, which have been removed in one piece The outer surface has a pinkish-yellow mottled appearance It is covered by a rather delicate fibrous capsule, which has been torn in places and adheres by firm hair-like adhesions The surface has a distinct lobulated appearance, the lobules varying in size from 0.5 to 2 cm Several minute cysts 1 to 2 mm in diameter are seen upon the surface The tissue has a rather firm feel, and is very nodular Section has been made through one area where near the surface a cyst has been opened This cyst is 1.5 cm in diameter and contains some thick, viscid, translucent material On section the cut surface presents a reddish-yellow mottled appearance Lobulations are definitely seen These vary in size from 1 mm to 1 cm and are of widely different shape The connective-tissue surrounding the lobules can be seen as distinct white bands It seems more abundant near the centre and in the posterior part Within the lobules can be seen minute translucent areas, which presumably are thyroid vesicles filled with colloid The entire lobe as far as determined by section has this appearance In the isthmus are areas of a more distinct red appearance The lobules are firm and definite translucent areas cannot be seen The appearance here approaches more nearly that of normal thyroid tissue

Microscopic Examination—A series of sections show two

definite processes. There is seen to be in the majority of the sections a marked increase in the size of the alveoli and in the amount of colloid present. In certain lobules this is much more pronounced, and suggests a simple hypertrophy, differing perhaps only in the tendency of the cells to assume a higher type in many of these large colloid alveoli. In other areas there is cellular proliferation with diminution or disappearance of the colloid material. The increase in the number of epithelial cells is very great while their approach to the columnar type is not so marked. An alveolar arrangement is frequently difficult to make out. Section through the wall of the small cyst, noted above, shows it to be in the centre of a minute encapsulated adenoma. The connective tissue of the gland is moderately increased in amount and there is considerable lymphocytic infiltration in areas.

It seems, then, that we may recognize two forms of exophthalmic hypertrophy, in the one form the disease begins in an apparently normal gland and the process is symmetrical, so that histologically we find everywhere the type of lesion so well illustrated in Fig. 3. Clinically in this form we recognize as a rule a very symmetrical enlargement of the gland, though one which never attains great size. The disease is of comparatively short duration, patients dying as a rule in from one to three years if untreated. The well known symptom-complex of the disease,—enlargement of the gland with exophthalmus, tachycardia and tremor,—is invariably present. In the other form the exophthalmic process is secondary or associated with some other type of thyroid affection. In three, or one-half, the cases in this series an associated simple colloid hypertrophy was found. The cases in this series illustrating this type are Nos. 4, 5 and 6.

This form is characterized clinically by a longer duration, by a greater increase in the size of the gland, and by lesser severity of the symptoms. These cases, however, all had exophthalmus, tachycardia and nervousness of greater or lesser severity. In Case V, while the enlargement of the gland was of 15 years duration, the symptoms of exophthalmic goitre had

developed more recently. In the other two cases these symptoms were present from the onset.

The histologic picture also differs. Instead of a uniform process, as in the former group, we see the exophthalmic hypertrophy only in foci or in various lobules scattered throughout the gland. In the cases where this hypertrophy is observed it is of a lesser degree. Other investigators have also recently called attention to the fact that exophthalmic hypertrophy is frequently associated with various pathologic conditions of the thyroid, as cysts, adenomata and carcinomata, and that these may be the unproduced atypical exophthalmic goitre symptoms. Usually there is present the nervousness, tachycardia and tremor of varying degree while the symptoms of exophthalmus may be wanting.

In typical cases of exophthalmic goitre, which present the well-known symptom-complex, all writers agree that the histologic changes found in the gland are definite and constant. They have been characterized as a true hypertrophy. They very closely resemble the compensatory hypertrophy which is seen in the remaining portion of the thyroid gland after its partial excision, and which in this manner has been so frequently produced experimentally in dogs. Briefly the changes are (1) a change of the epithelium from a low or cuboidal type to a high cylindrical form, (2) a gradual disappearance of the colloid material which seems to be one of the earliest evidences of beginning hypertrophy, (3) alteration in the size and form of the alveoli due to the hyperplasia and infolding of the epithelium, (4) increase in the vascular supply and in the connective tissue stroma.

As we have noted however in cases in which the symptoms are atypical no such definite changes are observed. We may see only in foci evidences of this process. It may amount simply to a change in the size and form of the cell, and perhaps instead of a single layer of epithelium lining the alveolus there may be two or more. There may be said to be, however, in all cases evidence of proliferation of cells with increased

activity Whether or not we shall be eventually forced to the conclusion that all the various affections of the thyroid gland characterized by cellular proliferation give rise to the symptoms, more or less complete, of Graves' disease is a matter which requires further study

As to the pathogenesis of this affection nothing can be said to have been as yet definitely established The main dispute is still whether the disease is of nervous origin or has its basis in an abnormal condition of the gland itself The majority accept the latter view, and hold that the disease is a manifestation of an excessive or perverted secretion of the thyroid epithelium This seems the most rational supposition and it is borne out by certain facts,—viz, the similarity in the histology of the compensatory hypertrophy and the exophthalmic variety, the relationship between the advancement of the hypertrophy and the duration and severity of the clinical symptoms, and the beneficial effects that are produced by removal of a portion of the hypertrophied gland What relation if any the parathyroids have to exophthalmic goitre has not been determined In none of these cases were these bodies examined The changes that have been described are not at all constant

In regard to the age of onset, the cases of this series correspond closely with those of other observers By far the greatest number appear between the ages of 20 and 30, five out of six cases are recorded above In one case, however, the age of onset was stated as 44 An onset before puberty or after 40 is rare The disease is much more common in females than males, the proportion as variously stated ranging from 3 to 1 to 17 to 1

VII—CHRONIC THYROIDITIS ONE CASE

CASE XXI—(Autopsy No 0-283) Autopsy April 18, 1900, by Dr Blumer Female, aged 40 No clinical history

Anatomical Diagnosis—Sclerodema with pigmentation of the skin affecting the face, posterior part of the trunk and extremities Acute sero-fibrinous pericarditis, with acute myocarditis and diffuse interstitial myocarditis Double hydrothorax with acute

fibrinous pleurisy on the left side Acute bronchitis with emphysema of the lungs and atelectasis of the lower lobes Chronic passive congestion of the liver Acute infectious nephritis Chronic interstitial thyroiditis Chronic interstitial mastitis Tuberculosis of a bronchial lymph-gland Small ulcers over the internal condyles of the humeri

Pathology—Macroscopic Examination The thyroid gland is small, firmer and somewhat grayer in color than normal It contains apparently an increased amount of connective tissue

Microscopic Examination—Marked changes in the gland are seen These take the form of a great increase in the interstitial tissue of the organ, producing compression and atrophy of the glandular substance The new-formed connective tissue is mostly in the form of a dense, fully-formed fibrous tissue, but there are areas in which the thyroid tissue is infiltrated with small, round, lymphoid cells, apparently representing a recent infiltration There is an increase in the elastic tissue The gland substance shows varying degrees of compression In some places it has almost entirely disappeared over quite wide areas, in other places it is apparently but little affected There is an abundance of colloid material in the slightly affected areas *Microscopic Diagnosis*—Chronic interstitial thyroiditis

This case is not introduced into this series to raise the question of the relation of the thyroid to the condition of scleroderma, but as a typical illustration of the pathologic changes produced in the gland by a chronic inflammatory process Acute inflammation of the thyroid gland frequently occurs following acute general infections, as typhoid and the exanthemata The chronic form is very often associated with other thyroid affections, the hypertrophies, cysts and tumors, and they present in varying degrees the condition here described

VIII—TUBERCULOSIS TWO CASES—ONE MALE, ONE FEMALE

No	Age of onset	Age at operation	Duration
1	40	42	2 yrs
2	35	43	8 "

In the first case the previous health of the patient was said to have been good, but death from pulmonary tuberculosis occurred six years after the operation. In the second case the history at about the time of the onset of the thyroid involvement suggested pulmonary tuberculosis. The patient now (two years after operation) is in good health and presents no evidences of active tuberculous disease in any organ.

CASE XXII—(Path No 64-2) This case I am able to report as tuberculosis of the thyroid only upon clinical evidence, as although the microscopic sections show tuberculous granulation tissue no thyroid structure can be made out. The patient was a male, aged 42. The disease began two years before with a small "lump" in the region of the thyroid gland which gradually increased to the size of a walnut, suppurated and discharged spontaneously, leaving two small sinuses which have persisted for a year. At the operation by Dr Macdonald the sinus tracts were found to lead down to the thyroid gland and they were excised together with the gland in one mass. Clinically, as recently related to me by the operator the process had its origin in the thyroid gland.

Pathology—Macroscopic Examination. The specimen consists of a piece of tissue about one-half the size of a hen's egg. It contains some tissue which is presumably thyroid gland, and leading into it from the surface of the specimen are two sinus tracts, the walls of which are extremely ragged and lined with yellowish purulent material. *Bacteriologic examination* fails to show tubercle bacilli.

Microscopic Examination—No thyroid tissue is to be seen. The section consists of connective tissue and of large areas of caseation. Surrounding these areas of caseation is typical tuberculous granulation-tissue, made up of epithelioid and lymphoid cells, and containing an occasional giant cell.

CASE XXIII—(Path No 64-21. History taken and physical examination made December, 1905, two years after operation.) Female, aged 45. When 14 years of age parents thought she had consumption but, if so, she recovered completely. She married at 21 and now has 7 children, all in good health. At birth of last child, 11 years ago, she had puerperal fever and was seven months in bed. After this had a severe cough, night sweats and con-

siderable expectoration During this illness her physician first noticed a small tumor in the median line of the neck in the region of the thyroid gland which gradually increased till 2 years ago, when it reached the size of a hen's egg It was tender on pressure and sometimes painful and caused some dyspnoea during the last year before operation It never showed redness or signs of inflammation The patient entered hospital at this time for an operation for uterine myomata and she was persuaded by the surgeon to allow removal of this enlarged portion of thyroid

Operation, November 5, 1903, by Dr A Vander Veer

Pathology—Macroscopic Examination Specimen consists of an irregular mass of reddish brown tissue 6x4x2.5 cm, in which lies a sausage-like mass This latter on section is found to be of a uniform consistency and of moderate firmness Color is slate brown and deviating striæ give to the cut surface a lobulated appearance

Microscopic Examination—(See Fig 5) The thyroid tissue shows marked proliferation of alveoli, the majority of which are massed together, making the outlines of individual alveoli indistinct, while others contain a moderate amount of colloid material In many of the lobules are circumscribed masses of epithelioid cells with occasional giant cells and a peripheral ring of lymphocytic infiltration But a few of the tubercles show early caseation

Microscopic Diagnosis—Tuberculosis of the thyroid gland

The patient was seen in December, 1905, 2 years after operation and this note on her present condition was made "Patient is fairly well nourished, but slightly anæmic There is a linear scar in the median line of neck 7.5 cm in length, extending from a little beneath the chin to the episternal notch Aside from a little thickening and redness at its lower end the scar appears healthy There is no apparent enlargement of any portion of the thyroid gland Patient has no cough and states that she is in good health and able to pursue her work Examination of the lungs reveals no evidence of disease, though the breath sounds at both apices and considerably subdued There is no glandular enlargement anywhere"

While it is true that tuberculosis of the thyroid gland is a rare disease, from recent studies it has been demonstrated that it is not so rare as was formerly supposed Thus P

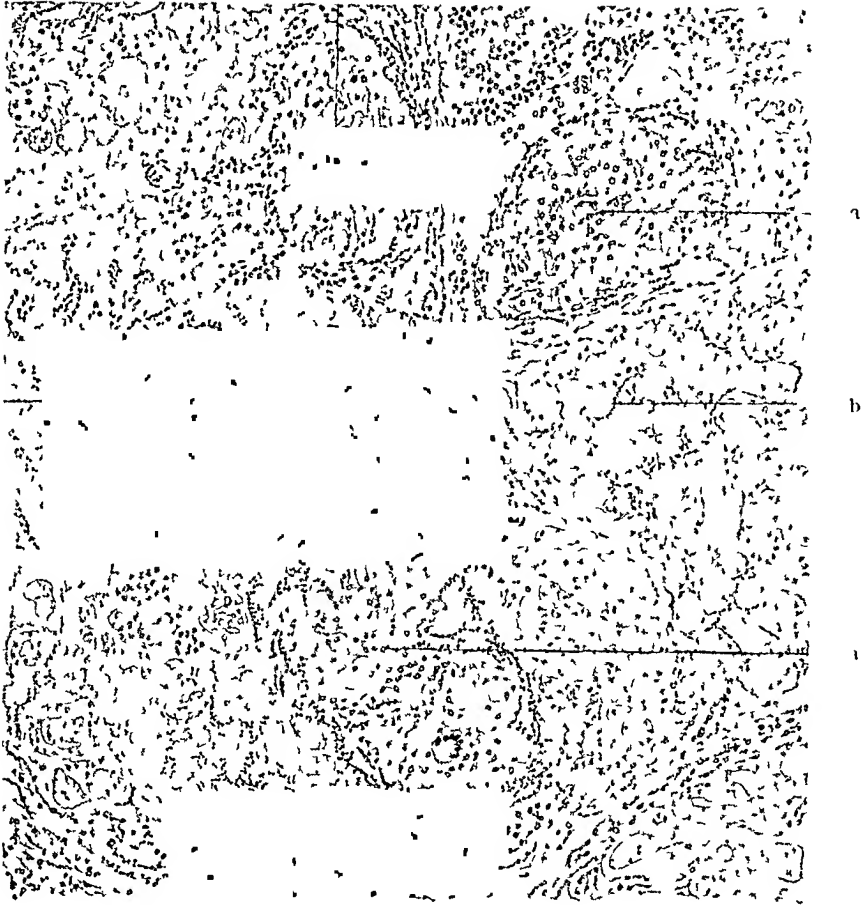


FIG 5—Microscopic drawing of tuberculosis of the thyroid gland, 4 oc 3 obj Leitz
 (a) Tubercles, in the lower one of which is seen a giant cell. In the centre of the drawing, between the tubercles, is an area of lymphocytic infiltration. (b) Normal thyroid tissue.

Bruns³ in his report of 100 post-mortem examinations made by Chiari of persons who had suffered from tuberculosis, states that the thyroid gland was involved in seven. Of these cases 96 had suffered from chronic pulmonary tuberculosis, and in only four of these was the thyroid gland involved, the other four were cases of acute miliary tuberculosis, and in three of these the gland showed involvement. Weigert in fifty cases of chronic pulmonary tuberculosis found tuberculosis of the thyroid in six. Two forms of involvement are recognized, a miliary form secondary to a general miliary tuberculosis, and a nodular form affecting the gland diffusely. The former is the more common. It does not produce any enlargement of the organ as a rule. Of the nodular form Bruns was able to collect six cases besides his own, in three of these from a clinical point of view the thyroid lesions were primary. This form is attended by enlargement of the organ sometimes sufficient to produce pressure symptoms. As illustrated in Fig V, these tubercles have the ordinary characteristics of tubercles in other organs. They probably always arise in the interstitial connective tissue separating the vesicles.

In the first case here recorded the data is so incomplete that no definite conclusions can be drawn. The clinical history states that the patient's previous health had been excellent, but there is no record of a physical examination to exclude a possible pulmonary involvement. Then the fact that he is said to have died 4 years later of pulmonary tuberculosis leaves us in doubt as to whether the disease was primary in the thyroid with secondary involvement of the lungs or *vice versa*.

W. B. Stanton⁴ has recently made the important observation that in a comparatively large number of cases of pulmonary tuberculosis there were symptoms more or less complete of exophthalmic goitre and in these cases he has been led to examine the thyroid glands. The report is only a preliminary one and no cases in which he has observed these symptoms have

³ Beitrage zur klin. Chir., 1897, xi

⁴ American Medicine, 1905, x, 605

died. He could not therefore give the results of histologic examination. Clinically there was slight thyroid enlargement. He records 26 cases of pulmonary tuberculosis aside from the above in which the thyroids were examined post-mortem, but in which the patients were not examined clinically for those signs. In these, tubercles were found in four. As serial sections were not made he thinks it probable that the proportion found to contain tubercles is much too small. Further investigation of this point might yield information of great value.

IX—CARCINOMA ONE CASE

CASE XXIV —(Path No 98-43) Female, aged 36, with history of illness for last three years. Prominent symptoms are enlargement of thyroid gland, with pain and anæmia. The patient was operated upon two years ago for thyroid enlargement, but no pathologic study of this specimen was made.

Second operation by Dr A. Vander Veer, February 18, 1899.

Pathology—*Macroscopic Examination*. Specimen consists of six masses of tissue, all roughly lobulated and varying in size from 6 to 3 cm in greatest diameter. They all present similar appearances and are not distinctly encapsulated, though portions of capsule are here and there evident. Where a capsule is present it is generally smooth and of a yellowish-red color. The portions of the growth which are uncovered by capsule are finely lobulated, of a light yellowish-brown color, and have a translucent appearance. This appearance suggests, in some places, the appearance of thyroid-gland tissue, in other places it has a myxomatous character. On section the nodules differ in appearance, the smaller and presumably the younger ones have an almost homogeneous yellowish-gray cut surface, which is covered by sticky mucilaginous fluid which has the glistening appearance of mucoid tissue. In one or two of the smaller masses are areas of hæmorrhage. In one rather large area of light reddish-brown tissue which does not look like hæmorrhage, there is an area homogeneous in character and slightly granular. In two of the largest nodules near the centre are areas of necrosis and calcification.

Microscopic Examination—Sections from two different portions show an adenomatous tissue divided into irregular lobules by

rather dense fibrous connective-tissue septa, which extend inward from a capsule which is present at one side. Except in a few small lobules near the periphery, where characteristic colloid-containing vesicles are seen, the tissue could not be recognized as thyroid-gland tissue. It is composed of papillomatous-like projections and long epithelial tubules with cavities of thyroid-gland spaces. This arrangement becomes complex and branching as the process develops, until they finally fill up the cavities, producing a gland-like appearance. The epithelium rests upon no visible basement-membrane, the stroma is very scanty. In the connective-tissue septa are many solid epithelial clumps which probably represent new foci of growth.

A section from the homogeneous mass differs only in that no connective-tissue septa are seen, and the spaces are more closely packed with epithelial cells. This section also shows acute inflammation. The epithelial cell is of a high cylindrical type, varying greatly in size and shape.

Microscopic Diagnosis—Adeno-carcinoma of thyroid gland

From one observation of carcinoma of the thyroid no important deductions can be made except to call attention to its relative infrequency. One case in 61 thyroid affections, as indicated by this series is, however, undoubtedly too low a proportion and not borne out by the statistics from other sources. Bloodgood⁵ in exactly twice the number of cases records seven of carcinoma. The most elaborate study of this condition that has appeared is by Ehrhardt,⁶ who has collected 150 cases of carcinoma. Sixty-five of these occurred in men and eighty-five in women, 111 appeared between the ages of thirty and sixty. In over 50 per cent of these cases it was definitely stated that a simple goitre preceded the development of the carcinoma, and in only a comparatively small number that it arose in a normal thyroid. This is the reverse of the condition seen in this country, probably due to the fact that we have no "goitreous districts." Ehrhardt recognizes three main varieties,—the medullary, which is the most fre-

⁵ Surgery, Gynecology and Obstetrics, 1905, 1, 113

⁶ Beitrage zur klin. Chir., 1902, 222v, 343

quent, the adeno-carcinoma, and the scirrhus. The latter is in his experience, rare. Metastases occur early as a rule. In nine-four bodies examined metastases were found in all but fourteen. In forty-six cases twenty-three had metastasized by the blood-stream alone, nine by the lymphatics alone, and fourteen by both these channels. As to the location of metastases, the lungs and bones are the most frequent seats. The bones of the skull and inferior maxilla are most commonly involved, though the sternum and long-pipe bones do not escape.

The average duration is about 2 years, the scirrhus form being the most chronic.

Clinical Diagnosis of Thyroid Affections —When we bear in mind that the symmetrical enlargement of the thyroid gland indicates a hypertrophy, and the asymmetrical a tumor or a cyst, we have gone a great way towards making a diagnosis. To characterize all of the enlargements of the thyroid as "goitre" is obviously improper, as it conveys no intelligent clinical or pathologic meaning. If this term is used, it should apply to the hypertrophies, and we can then properly speak of the simple goitre and the exophthalmic goitre. To differentiate these latter conditions clinically is not difficult, for in exophthalmic goitre the subjective symptoms are definite and constant. In the simple form the rule is a much greater increase in the size of the gland but no symptoms except those produced locally by pressure. The age of onset and the duration of the disease are also important aids in diagnosis, as has been shown in the preceding tables. In the simple hypertrophy the age of onset in a large proportion of cases is before twenty. In an accurately recorded history I believe it would be exceptional to establish an onset after twenty-five. In the exophthalmic variety an onset before twenty is extremely rare, the majority of cases appear between the ages of twenty and thirty. The duration of the disease in the simple form is much longer, often twenty or thirty years, while that of the exophthalmic hypertrophy is usually less than two years. Where these two conditions are associated, or where the exophthalmic hypertrophy appears secondary to other thyroid

affections, greater variation in these respects is seen. We must bear in mind that in either form of hypertrophy the process in one lobe may have advanced further than in the other, producing an asymmetrical enlargement, but on the other hand no part of the gland appears normal. In other words the process is a diffuse but not always an uniform one. Again, we have seen in certain cases a fairly symmetrical enlargement produced by an adenoma or cyst in either lateral lobe. These multiple tumors are comparatively rare, however, and on close examination present distinctive features. Of the tumors, the cysts and the adenomata are the most frequent, and they are often very difficult to differentiate. They both present the features of encapsulated tumors. The cysts are more apt to be smooth and ovoid in shape, while definite lobulations can often be made out in the adenomata. Variation in the size of the tumor seems to be frequent in the case of cysts. In regard to the recurrent adenomata, two of our observations at least would point to their being of a mild type of malignancy. Considering the long duration, however, and the fact that no metastases occurred, they do not present the features of carcinoma of the thyroid. In one case a secondary growth appeared in the region of the primary one.

From the fact that metastases of the thyroid tissue occurs in cases in which no primary tumors of the gland has been noted, bone tumors looked upon as primary should be approached with this possibility in mind.

Early diagnosis of the carcinomata presents the greatest difficulties and obviously is of the greatest importance. Age here is to be considered as indicated by the statistics of Ehrhardt. The disease is usually of short duration, a few months to one or two years. As met with in this country, carcinoma of the thyroid does not produce a large tumor, but it rapidly infiltrates the gland and surrounding tissue and dyspnoea and dysphagia are early symptoms and out of proportion to the size of the growth. Change in the voice is also an early observation (Bloodgood). In districts where simple hypertrophy is

endemic a very large proportion of the cases of carcinoma, as recorded by Ehrhardt, are secondary to this condition. Here the important feature is a sudden increase in size in the hypertrophied organ, with the return of symptoms after a quiescence of perhaps many years. Primary sarcoma of the thyroid is a rare affection and as no cases were observed in our series the condition will not be discussed.^{*}

Treatment —As the symptoms in the uncomplicated cases of simple hypertrophy and benign tumors are of a mechanical nature, the severity of these symptoms has been our guide in treatment. Rarely is operation undertaken for the relief of the deformity alone. I believe, however, that since so large a number of these cases undergo secondary changes in later life, making operation imperative, that they should be considered upon the same basis as similar lesions in other organs. In the case of the tumors and cysts an early operation is advocated. With the simple hypertrophy, if the patient has passed young adult life, the period when we might expect a subsidence of the process, and the gland continues to enlarge, a portion of it should be removed. If after a quiescent period new growth is observed, operation may be necessary for the relief of urgent pressure symptoms, and here, too, carcinoma must be considered. Scarcely fifty years have passed since Dieffenbach considered thyroidectomy a rash undertaking. To Kocher more than anyone else is due the credit of the advances in this field of surgery. At the German Surgical Congress, in 1900[†], he reported the results of his second thousand cases of thyroidectomy, of which 929 were upon cases of simple hypertrophy and benign tumor. He had only four deaths, giving a mortality of 0.4 of 1 per cent. The greatest single factor contributing to this low mortality-rate was undoubtedly the substitution of local for general anæsthesia.

The general principles which guide us in the treatment of

^{*} For report of cases and statistics see Lartigau (Amer Jour Med Sciences, 1901, cxlii, 156)

[†] Archiv für klin. Chir., 1900, lxiv, 454

carcinoma of other organs should apply here, remembering that metastases occur early. Operation to effect a cure must be undertaken before there is extensive invasion of the surrounding tissues.

In the treatment of exophthalmic goitre the various drugs and methods employed are almost innumerable. The weight of opinion now seems to favor partial thyroidectomy, and I believe justly so, for with the accumulating statistics the percentage of cures is increasing and the number of primary deaths decreasing. No other form of treatment has offered so much hope. The observations in this series have been made entirely on the operative treatment, but to give an opportunity for comparison I may be allowed to quote from a review of the literature made recently by the writer,⁸ in which the results of some of the other more recent methods of treatment are recorded. "In late years attempts have been made in many German clinics to develop a specific treatment of exophthalmic goitre." Lanz,⁹ as early as 1894, began the use of the milk of thyroidectomized goats in patients with Graves's disease. He has recently recorded favorable results in five cases. Burghart and Blumenthal¹⁰ in Leyden's clinic have injected the blood-serum of amyxo-œdematous patients into those suffering from exophthalmic goitre. Leyden reviews their results and thinks they are encouraging. Later, in this clinic, was introduced the use of a precipitate from the milk of thyroidectomized goats, called "rodagin." A few cases are recorded of slight improvement after continued use of this substance. Kollaritis reports no improvement in three cases in which he employed this method.

Moebius and Schultes¹¹ have used the serum of thyroidectomized sheep. This serum is called *antithyroidin*. Moebius reports three cases somewhat improved by this treatment and

⁸ Albany Med. Annals, 1906, xxvii, 111.

⁹ Munch. Med. Wochenschr., 1903, I, 146.

¹⁰ Deutsche med. Wochenschr., 1899, xxv, 627.

¹¹ Munch. med. Wochenschr., 1901, xviii, 1873.

later two other cases which were benefited Schultes and Rosenfield have likewise each reported a case In a recent communication Moebius¹² speaks rather guardedly of the employment of this serum Kuh,¹³ after treating eleven cases with the serum, is unwilling to make any statement as to its curative effect He thinks it relieved nervousness and diminished tachycardia

In regard to the operative treatment, in four of our six cases the partial excision of the thyroid gland has been attended with excellent results In two of these all the symptoms have been relieved, in one the operation was of too recent date to determine the ultimate result, but the symptoms one month after operations improved in all respects, in the other all the symptoms except exophthalmus had disappeared, and the patient is able to pursue her work The time now intervening since operation varies from one month to four years, as shown in the table Of the two deaths one could be ascribed to the anæsthetic, and the other, in which death took place on the eighth day with the symptoms of extreme hyperthyroidization, as a late case probably beyond possible recovery It should be borne in mind that the operative treatment, to be of the most value, should be undertaken early, before damage has been done to the nervous system In this condition even more than in other forms of thyroid affections, the importance of local anæsthesia cannot be too highly estimated As further proof of the superiority of the operative treatment, the statistics of a number of observers are quoted The best results of partial thyroidectomy yet published are those of Kocher—59 cases 75 per cent cured, 17 per cent improved, 6·7 per cent dead

At the last German Surgical Congress, April, 1905, Friedheim from the clinic of Kummel reported the results of twenty cases of partial thyroidectomy after five or more years had

¹² Munch med Wochenschr, 1903, 1, 146

¹³ Medicine, 1905, xi, 672

elapsed Fourteen were cured, two much improved, three slightly improved, and one had died In seven of the cured cases the operation had been performed nine or more years previous, in one, fifteen and a-half years He further presents the statistics of the other large German clinics for the last years as follows

	Cases	Cured	Improved	Dead
Von Mikulicz	18	10	7	1
Kronlein	24	16	6	2
Kocher	59	45	10	4
König	8	4		1

BRANCHIAL FISTULA¹

BY MARTIN JOSEPH CHEVERS,

OF MANCHESTER, ENGLAND

THE arrested development theory as to the formation of branchial fistula is based on the facts that during the preliminary stages of development of the embryonic face, ear channels, and alimentary tract, a series of arches and clefts are formed, the clefts being first formed, the arches being merely the thickening of the sides of the clefts. There are two sets,—those placed in front of the mouth to be, and those placed behind the structure. We are now only concerned with the postoral or visceral arches and clefts, five of the former and four of the latter, and of these in speaking of branchial fistula, we need only consider the true branchial arches and clefts. The true branchial arches are the third, fourth and fifth, and the true clefts are the second, third and fourth. A portion of each cleft is used up in the process of development, failure of the complete closure of the remaining portion of either of these clefts, most commonly the third¹ possibly the fourth,² results in a fistulous tract called a branchial fistula. Frequently this does not make itself evident until some time after birth. Such a fistula traverses the tissues of the neck communicating with the pharynx and sooner or later discharges externally. The present day teaching, as to the treatment of a branchial fistula, is to dissect it out thoroughly, and the success of such a proceeding is doubtful, many advise it to be left alone, others say that it is impossible to close the whole track, and by trying to do so the result would likely be closure of the orifice and formation of a cyst. These facts have prompted me to report a case of this congenital abnormality which I have recently successfully treated by croton oil and galvanism, a treatment

¹ Read before the Manchester Medical Society on March 7, 1906

which I think warrants further trial, for the result of the treatment in this case has been a permanent cure

On March 16, 1905, a woman, 22 years old, presented herself and examination revealed a fistula extending from the clavicular origin of the sterno-mastoid, at which point it was discharging, to the level of the upper border of the hyoid bone. There was no tumor, hard or soft, either in connection with the fistula or anywhere in the neck. During the treatment it was discovered that there was at least one communication with the pharynx. There was no history to be obtained, except the fact that it had been discharging since she was a child, and that the amount of discharge had increased considerably for the past two or three years. An ordinary probe passed comfortably, and without any pain, into the opening immediately over the origin of the sterno-mastoid, and upwards for $3\frac{1}{4}$ inches, ending, as it seemed, just above the hyoid bone. On extraction of the probe there followed a slight discharge of sero-purulent or sebaceous fluid, but no trace of blood.

Next day I injected through a very small gum-elastic urethral catheter, which was first passed into the fistulous tract, a 1-in-40 phenol solution, and washed the sinus out. Some of the solution entered the pharynx and was spat out. The day following I again syringed it out, and passed and left in place a silkworm-gut drain. On the third day, after having syringed it out, I twisted together and passed four lengths of No. 2 silkworm-gut, having first dipped them in croton oil. I passed them to what I believed to be the upper extremity of the fistula, my object being, of course, to try and destroy the lining mucous-membrane, and in which, it seemed, I to some extent succeeded, judging from the copious discharge of pus there was on the dressings the following day. After two more days of antiseptic syringing and draining I passed to the upper extremity of the fistula a silver-wire electrode bent on itself, the blunt bent extremity being passed into the fistula and the two sharp ends of the other extremity fitted into a handle which was connected with the cathode wire. The current was gradually increased from zero up to 5 milliamperes, and then gradually reduced to zero again. The anode was then made the active electrode on the inside of

the fistula and gradually increased from zero up to 10 milliamperes and reduced slowly to zero again. No drainage was provided for. The next day, and every day for a week, I applied a flat flexible tin electrode to the skin surface immediately over the sinus only. At each application I first made the cathode the active electrode, increasing the strength of the current from zero to from 15 to 20 milliamperes for a few minutes, and then reducing again to zero, after which I made the anode the active electrode in the same way, but reaching from 30 to 35 milliamperes. Before adopting the application of the alternating currents to the external surface of the fistula, there was a discharge from the exit on applying pressure over the course of the fistula, but after four or five days of the external treatment this discharge disappeared, and at the end of the week's application the watery external discharge, produced on application of the cathode as the active electrode, ceased *externally*, but on such application, and at intervals during the day, the patient complained of a bitter fluid discharging into her throat. The applications were continued for another week, up to April 13, with continued good effect. During the two days previous to April 13 the patient only felt the bitter discharge into the mouth once, and that very slightly. The applications were therefore discontinued on that date.

I need not remind you that the cathode, which attracts hydrogen and alkalies, causes, through its irritative and stimulating effect, congestion, softens and liquefies the tissues, causing a watery discharge, and on application of the anode, oxygen and acids are attracted, which have a tonic and astringent effect, harden and dry up the tissues, and cause contraction of the passage, so that if this electrode is left in too long it may be impossible to withdraw it without damaging the adjacent parts.

It has been shown³ that the therapeutic results and chemical changes brought about by a single five minutes seance with a current strength of from one to two milliamperes so alters muscle-structure that evidences of it can be seen for several days after. It seems probable that the interpolar chemical changes set up have caused the cure of this case, possibly assisted by the use of a silver electrode. But I don't think that very much therapeutic effect could be attained from the use of a silver

electrode which ionizes with difficulty as compared to metals such as lead, zinc and copper, although it is recognized that on applying the positive pole there is some movement of silver ions into the tissues, causing the liberation of oxygen and chloride and the formation of insoluble silver chloride

On April 15 I removed the pharyngeal tonsils, which had been chronically enlarged for some time, causing nasal breathing I ceased attendance on April 30

On July 29 I received a report that there was not the slightest sign of the old trouble I, myself, examined the patient on September 15, and again in January, and with the exception of very slight redness, no bigger than a pin's head, there was absolutely no sign of the trouble

The treatment as applied in this case carries with it a certain amount of risk, owing to the proximity of important structures, but by exercising a little care the slight risk is, I think, warranted by the result

There is, I think, no differential diagnosis requisite in this case, for there was no bulging or tumor of any sort in connection

As the patient has now been a year without the slightest return of the old trouble, I think I am justified in claiming a cure

This treatment in place of excision might also be applicable to a patent Thyroglossal duct and cyst, a somewhat different state

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¹ Chalmers Watson *Encyclopædia Medica*, Vol 8, p 240

² Quain's *Embryology*, Vol 1 part 1, p 103, and Mr Lockhart Mummery in reporting a case before the Society for Study of Diseases of Children—B M J, Nov 4, 1905

³ *Electro-Physiologie*, "Weiss," p 127

DIAGNOSIS OF ESOPHAGEAL LESIONS ¹

BY BERTRAM W SIPPY, M D,

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Two classes of diseases of the esophagus may be distinguished—functional and anatomical *Functional disease*—There are two chief functional disorders of the esophagus One is related to sensation, the other to motility

Sensory Disorders—The only disorder of importance relating to sensation is hyperesthesia Hyperesthesia of the esophagus is not infrequently the cause of discomfort occurring during the act of swallowing The discomfort may be burning or smarting in character, and is usually felt along the whole length of the esophagus, but may be referred to the epigastric region alone There may be other manifestations of a neurosis present, such as tenderness along the spine, or hysterical stigmata elsewhere One cannot be sure that hyperesthesia alone is present until after the passage of bougies, and, if possible, the use of the esophagoscope In hyperesthesia of the esophagus, which usually extends throughout the whole length of the organ, as soon as a bougie passes beyond the pharynx and enters the esophagus the patient complains of great pain, which continues as the bulbous point of the bougie is pushed down the whole length of the esophagus Hyperesthesia may be associated with slight spasm at any point in the esophagus, but real obstruction to the passage of bougies is not present Upon passing the esophagoscope a normal mucous membrane is found Such cases are not extremely rare I have seen three during the last year

Anesthesia of the esophagus may result from central lesions of the nervous system, or occur as a manifestation of a

¹ Read before the Chicago Surgical Society, February 2, 1906

neurosis No practical importance is as yet attached to the condition

Motor Disorders—Spasmodic contraction of the circular fibres of the esophagus may take place at any level of the tube The so-called "globus hystericus" is due to spasm of the esophagus Esophageal spasm is not usually followed by serious results, except when it occurs at the upper and lower ends Esophageal spasm will be discussed with the other causes of stenosis of the esophagus

Anatomical Disease—Inflammation of the esophagus serious enough to be of clinical importance is not common, except when caused by the ingestion of caustic alkalies, acids, and metallic salts Deglutition is painful and the history of the case will usually render diagnosis easy If necessary, the esophagoscope may be used to differentiate the condition from hyperesthesia Inflammation of the pharynx seldom extends to the esophagus The esophagus is almost immune to diphtheria, and is rarely inflamed in measles, scarlet fever, smallpox, and typhoid fever Tuberculosis of the esophagus is extremely rare, likewise syphilis Actinomycosis of the esophagus has been described

Ulcer—Ulceration of the esophagus seldom occurs, except in association with carcinoma There have been less than forty cases of peptic ulcer of the esophagus reported Peptic ulcer may occur anywhere in the lower third of the esophagus If at the very lower end, owing to the vascularity of the part, hemorrhage is likely to be a prominent symptom Ulcer of the esophagus may be readily detected by the esophagoscope

Esophageal Stenosis—By far the most common and serious disorders of the esophagus are related to conditions producing obstruction to the lumen of the tube The early diagnosis of esophageal obstruction is very important The first symptom is usually discomfort or pain occurring during the ingestion of food Whenever a patient complains of discomfort while eating, we should always think of the following conditions as possible causes Disorders of the esophagus,

ulcer or carcinoma at or near the cardiac end of the stomach, perigastritis, perigastric adhesions, epigastric hernia, nervous dyspepsia, and gastritis. The discomfort or pain of esophageal stenosis is usually located at the seat of the obstruction, but may be referred to the epigastric region or to the back. As the stenosis increases, the patient may be conscious that the food is arrested at a certain point in the esophagus, and that greater time and effort are required to force the food into the stomach. The patient usually knows when the food passes the obstruction. As the lumen of the tube grows smaller, the sensation of fulness behind the sternum, due to accumulation of food above the seat of the stricture, increases. If an attempt is made to eat rapidly, a choking sensation results, and the contents of the esophagus are regurgitated. The patient frequently describes the act of regurgitation as vomiting. Whenever a patient complains of discomfort, pain or vomiting at the time of eating, we should never neglect to put him to the test, and observe what happens during the ingestion of food and drink. If stenosis has been present even for a short period, the patient has learned to eat slowly, to take small bits of food, and to reduce them by prolonged mastication. If the stenosis is considerable, even liquids are sipped slowly, and the act of swallowing is frequently repeated. That a distinct effort is required to cause the food to go down is clearly apparent. When urged to eat more rapidly, the patient usually indicates that it is impossible. Discomfort is evident, an attempt may be made to wash the food down with water. If unsuccessful, and the eating is forced, an involuntary contraction of the abdominal muscles and diaphragm takes place, and the contents of the esophagus, food usually mixed with a large quantity of mucus, flows out of the esophagus, without the expulsive effort that is usually associated with vomiting. Nausea is usually absent, although nausea and vomiting may be excited by the act of regurgitation. The patient is nearly always able to distinguish between regurgitation and vomiting, if his attention is called to the difference between the two acts. Pain, cramp-

like or dull in character, may be a prominent feature. Pain, however, is not invariably present. I feel justified in mentioning the apparently trifling details of the symptomatology of esophageal discomfort and regurgitation, because experience shows that grave error in diagnosis is constantly made. Esophageal disorders are mistaken for gastric disease, even gastroenterostomy has been needlessly performed, when more careful attention to symptomatology combined with the observation of the patient while eating would have clearly shown that the disorder was located in the esophagus.

If the history and observation of the patient while eating make it probable that stenosis of the esophagus is present, a stomach-tube or bougie may be used to locate the obstruction. First, however, the patient should be carefully examined, to determine whether contraindications are present to the passage of such instruments. Aneurysm should be carefully excluded. High grade arterio-sclerosis, history of previous cerebral hemorrhage, heart incompetency, and other conditions may render the procedure unsafe. It is usually best to attempt to pass a soft stomach-tube first. The exact seat and degree of obstruction are, however, more accurately determined by a flexible bougie with graduated olive tips.

It is generally easy to diagnose and locate the seat of esophageal stenosis. To determine the nature of the obstruction is sometimes exceedingly difficult. In adults, carcinoma is by far the most common cause. This too often leads to serious error, since it is assumed upon insufficient evidence that esophageal stenosis is due to carcinoma. In a given case all other causes should be carefully considered before concluding that carcinoma is present.

The conditions that may lead to stenosis may be divided into extra- and intra-esophageal. Stenosis resulting from extra-esophageal cause is rare. Among such causes may be mentioned aneurysm, mediastinal tumors, spondylitis, pericardial effusion, esophageal diverticulum. Stenosis from intra-

esophageal conditions results from tumor, cicatrix, spasm, diverticulum, and foreign bodies

Tumors of the esophagus may be benign, but are usually carcinomatous. Sarcoma may invade the esophagus from surrounding structures.

Carcinoma of the esophagus is characterized by the symptoms of stenosis, as described. The onset is usually gradual, although difficulty in swallowing solids may appear suddenly. As in organic stenosis from all causes, difficulty in swallowing solids usually appears first, liquids later.

The course is progressive, marked by slight variations in the difficulty in swallowing. Considerable improvement may be noted upon the administration of non-irritating liquid foods. A gain of several pounds in weight is possible for a time, by giving an abundance of milk and cream.

The location of the obstruction is of value in diagnosis. It is estimated that approximately fifty per cent of all cases of esophageal carcinoma develop at the cardia, or immediately above, at the point where the esophagus passes through the diaphragm. About forty per cent develop at or near the bifurcation of the trachea, and only about ten per cent in the upper or cervical portion of the esophagus.

Metastatic growths are seldom of value in the early diagnosis of esophageal carcinoma, although they should be sought in the liver, cervical glands, lungs, pleura, and elsewhere. Since there is a tendency to early ulceration, a valuable diagnostic sign is the presence of blood in the stools, detected by the Weber test. Upon attempting to pass the stomach tube, odor characteristic of a sloughing mass often aids in diagnosis. The esophagoscope passed to the seat of the obstruction reveals either an ulcerating, bleeding, perhaps sloughing, mass, or nodular irregularities. Although a temporary gain in weight may be produced by appropriate feeding, the course of the disease is progressive. Emaciation and final cachexia supervene. After the first symptoms of difficulty in swallowing become manifest, the average duration of life is six or eight months.

Perforation into a bronchus is characterized by violent cough upon the ingestion of liquids. Broncho-pneumonia and death soon follow such a complication.

The blood changes of secondary anemia, such as are associated with carcinoma elsewhere, are of aid in differentiating benign from malignant stenosis.

Cicatrix —Cicatrix causing esophageal stenosis is usually associated with a history of swallowing caustic acids or alkalis, although in some cases the incident is forgotten, and careful questioning is necessary to bring out such history. If the escharotic is strong, symptoms of stenosis begin at once. If mild, they may be delayed for several months. Cicatrix from peptic ulcer is an extremely rare cause of esophageal stenosis.

The history, course of the disease, and passage of bougies are usually sufficient for the diagnosis of cicatricial stenosis of the esophagus. If not, the esophagoscope may be used to advantage.

Diverticulum —Diverticula of the esophagus are pouch-like sacculations of a portion of the circumference of the tube. Three forms based on etiology are recognized: Pressure diverticula, traction diverticula, and traction-pressure diverticula.

Traction diverticula are found frequently at autopsy, but seldom produce symptoms. The same may be said of traction-pressure diverticula. Pressure diverticula of the esophagus are relatively rare, but of much more serious import than the other forms. They usually develop at the upper end of the esophagus, or immediately above the left bronchus, or in the lower third of the esophagus. Clinically, the most important pressure-diverticulum is located at the upper end of the esophagus, and is known as Zenker's diverticulum. The origin of the sacculaton is at a natural defect in the posterior wall of the esophagus, just below the pharyngo-esophageal orifice. Accumulation of food at this point may cause a pouch-like sacculaton, which at first develops posteriorly, and later occupies a lateral position, usually to the left of the esophagus. As it develops, it projects downward along the course of the esoph-

agus The capacity of the pouch varies from a few cubic centimetres to half a litre or more In the early stages, slight discomfort such as dryness and irritation about the throat, is present Later, the sensation of a foreign body may be noted, and, finally, difficulty in swallowing is experienced As the sacculation increases, the accumulated food crowds the wall of the pouch against the esophagus, and obstructs its lumen At such a stage difficult deglutition and regurgitation of food are present In one-third of the cases a tumor is discoverable in the neck It may be located behind or at one side, rarely on both sides, of the trachea The patient often learns to empty the sac by making pressure upon it with the hand A peculiar gurgling sound accompanies swallowing in many cases *Fetor ex ore*, due to decomposition of food retained in the pouch, may be a prominent feature It is often noted that swallowing is accomplished easier during the early part of the meal As the sac fills, the esophagus is crowded upon, and its lumen obstructed Upon attempting to pass a bougie it is usually arrested in the sac If the bougie is slightly withdrawn, and the direction of its point changed, it may be passed into the esophagus At times a large-sized bougie passes more readily than one with a small point It frequently happens that a bougie may pass readily one day and not the next Very little difficulty in swallowing may be present in cases in which it is impossible to pass a bougie After swallowing liquids a small stomach tube may be passed to the seat of the obstruction, and the contents of the sac aspirated with an Ewald bulb Secretions containing lactic acid and numerous micro-organisms may be obtained from the sac Bismuth suspended in oatmeal gruel may be swallowed, and if sacculation is sufficient the X-ray will show the location and approximate size of the sac The esophagoscope is rarely of much value in the diagnosis of diverticula

Spasm —Spasm of the esophagus may occur at any point in the tube As a rule, contraction of the muscular fibres is not firm enough to produce obstruction, except when occur-

ring at the upper and lower ends of the esophagus Stenosis from spasm of the upper end is usually slight, and will not be discussed further here

Cardiospasm—Spasm of the lower end of the esophagus, if long-continued, results in dilatation of the esophagus, and unless relieved, emaciation and finally death from starvation is likely to occur Although not many cases are reported in the literature, the condition is not rare, and because of its seriousness the clinical picture should be more generally known. Normally, the cardiac end of the esophagus is closed by the contraction of its circular muscular fibres During the act of swallowing, the circular fibres are automatically relaxed, and no hindrance is afforded to the passage of the contents of the esophagus into the stomach If the automatic relaxing influence that occurs in swallowing is withdrawn, the closure of the cardiac orifice is firm enough to hold a column of water near the height of the esophagus If the automatic force that should relax the cardia is impaired, or if a slight spasm of the cardia is present, food and drink accumulate in the esophagus, and if an attempt be made to eat or drink rapidly, regurgitation is likely to follow If spasm is only slight, regurgitation may not occur, provided the patient eats or drinks slowly Proportionate to the obstruction, the retention of food causes lateral pressure, which may be counteracted by an increase in the strength of the esophageal peristalsis The tendency, however, is toward dilatation of the esophagus above the seat of obstruction Following ordinary physiological laws, the muscular fibres of the esophagus hypertrophy, in their attempt to force the contents of the esophagus through the orifice narrowed by spasm In most cases the spasm is so moderate that for several months and even years the increased strength of the esophageal peristalsis overcomes the obstruction sufficiently to prevent great loss in weight

The continued overfilling of the esophagus caused by the spasm of the cardia leads to a fusiform dilatation of the organ The retained food is likely to decompose, and cause irritation

Thus inflammation and even ulceration of the mucous membrane of the dilated tube may arise. This is likely to be followed by reflex spasm of the cardia, and an increase in the obstruction. The capacity of the normal esophagus is about 100 c c. The capacity of a dilated esophagus, caused by cardiospasm, varies from 150 to 1800 c c. No doubt the extent of the dilatation is governed largely by the rapidity with which obstruction develops. If the retention of food is moderate, hypertrophy of the esophageal wall may keep pace and prevent undue dilatation. If retention is great before hypertrophy has had time to develop, the fusiform dilatation is likely to be proportionately large. In most cases the capacity of the dilated esophagus does not exceed five hundred c c. The muscular spasm is on a nervous basis, hence the condition is likely to be found in nervous individuals. It has developed after profound emotional disturbances, such as fright, grief, and worry. In one case reported the difficulty in swallowing followed the suppression of menstruation. The patient feared she was pregnant. A blow on the sternum was the exciting cause of another case. The condition had developed during the course of acute infectious diseases, such as pneumonia and scarlet fever. A congenital case has been described.

The diagnosis of cardiospasm should not be difficult. The usual symptoms of stenosis at the lower end of the esophagus are present, with modifications peculiar to cardiospasm. The onset of the difficulty in swallowing may be sudden, or gradual. Mild grades of obstruction simply cause the patient to eat slowly. A sensation of fulness in the esophagus, and a feeling that the food and drink are arrested before they reach the stomach, is usually experienced. At first liquids are often swallowed with greater difficulty than solids. Before the esophagus is dilated, solids may be grasped by the peristalsis and forced through the cardia, while liquids more readily escape upwards. After dilatation occurs, obstruction is present alike to solids and liquids. Normally, immediately after swallowing food or drink, nothing can be aspirated from the

esophagus When cardiospasm is present, several c c of liquid containing food particles and mucus may be regained from the esophagus even hours after the ingestion of food and drink In the case under my own observation, 500 c c of water could be aspirated from the esophagus several minutes after it had been swallowed The stenosis was so impervious to liquids that an ounce of olive oil given at night was recovered from the esophagus the next morning, practically without the loss of a drop, and yet, the lower end of the esophagus presented no anatomical narrowing A very striking and diagnostic feature is that there may be little or no obstruction to the passage of the tube or bougie, even in cases in which a large quantity of liquid is retained in the esophagus A very moderate spasm of the cardia may not be overcome by the peristaltic force of the most powerful hypertrophy of the muscular fibres above the seat of obstruction As soon as the point of least resistance is above, regurgitation of food occurs Normally, the thickness of the esophageal muscle varies from a half to two millimetres In the case mentioned the hypertrophied muscle fibres were nine millimetres in thickness No doubt several years were required for the development of such a hypertrophy In the average case a bougie is arrested for a moment at the cardia, and then upon making slight pressure it passes through into the stomach A large-sized bougie often passes as readily as one of smaller calibre The difficulty in swallowing usually fluctuates more than it does when stenosis is due to organic disease Excitement, overwork and worry are likely to increase the spasm The patient may awake at night to find the pillow flooded with the contents of the esophagus The horizontal position favors regurgitation In organic stricture the retention of food and secretion in the esophagus is moderate compared to that which may be retained as a result of cardiospasm X-ray pictures of the dilated esophagus may be obtained by causing the patient to swallow a five-per-cent suspension of bismuth subnitrate in oatmeal gruel, until the "choking-up" sensation just short of regurgitation is developed The esophagoscope

shows the cardia closed. The mucous membrane above the seat of constriction is reddened, and in some cases erosion and ulceration are present. Redundant folds of mucous membrane may be visible at the seat of the dilatation. Diverticulum causing obstruction at this point is so rare that there is seldom difficulty in differentiating the condition from cardiospasm. Rumpel's differential test consists in passing into the stomach a stomach-tube with many lateral perforations in its lower half, another tube without lateral perforations is passed into the diverticulum. Water is now introduced through the tube that is supposed to rest in the diverticulum. The diverticulum fills, and the excess passes into the stomach through the perforations in the tube that is introduced into the stomach. The quantity held by the diverticulum may now be withdrawn by using an Ewald aspirating bulb. If a fusiform dilatation is present, no water is regained because it will be lost by passing into the stomach through the perforations in the stomach tube. The successful issue of this test presupposes the ability to pass the perforated tube into the stomach, and the other into the diverticulum. If the results of the test are negative, diverticulum could not be thereby excluded. Modifications of this test of some merit have been made by Jung, Kelling, Krauss, Buckelmann, and others.

After dilatation of the esophagus occurs, unless the spasm is overcome, symptoms are likely to persist. As a rule, emaciation does not occur rapidly at first. The nutrition of the patient may not be greatly reduced for years. He learns to eat slowly and to help force the food down by taking a swallow of water, often combined with a deep breath. Other aids to swallowing are adopted, such as throwing the arms and shoulders backward imitating the motion of the sea-gull in swallowing a fish. The motions used in rowing have also been used to aid in forcing the food into the stomach. Experience shows, however, that sooner or later the difficulty in swallowing increases. Regurgitation of food occurs more regularly and persistently. Emaciation develops, and starvation is the result, unless the spasm is over-

come or gastrostomy performed. Early diagnosis and relief of the condition are important, since after dilatation develops and becomes fixed and hypertrophied, the tube will always show some sacculatation, and predispose to the accumulation of food, which is likely to excite reflex spasm of the cardia, and cause a return of the difficulty.

The best treatment of the condition—forcible dilatation of the cardia—does not come within the province of these remarks.

POSTOPERATIVE ILEUS ¹

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AMONG the serious complications which may follow a surgical operation involving the opening of the abdominal cavity, there is none, except secondary hæmorrhage, which more urgently demands an early diagnosis and prompt relief than intestinal obstruction. In isolated instances it has been observed after operations where the peritoneal cavity was unopened. Just at the time when the surgeon has begun to be relieved somewhat of his anxiety, and to congratulate himself that once more his labors have been crowned with success, it is most disheartening to patient and surgeon alike to be confronted with the added perils of a secondary operation. Fortunate is he who has never been called upon to face this distressing situation, and but few surgeons there are, I fancy, with an operative practice at all extended, who cannot recall some such experience, for, unfortunately, postoperative ileus is not a rare affection.

It has been my misfortune to have met with twenty-six cases of postoperative ileus in my hospital and private practice, twenty-two of which required secondary operation of one sort or another, and I am sure, although I have not complete records of these cases, that during this time I have seen an equal number in the practice of my colleagues in the Johns Hopkins Hospital, and elsewhere.

Baisch,¹ in a recent historical review of postoperative ileus, gives to Sir Spencer Wells² the credit of the first description of this condition, in a paper published in 1860

¹ Read before the Chicago Surgical Society, February 28, 1906

This case was due to an adhesion of a coil of intestine to the stump of an ovarian cyst. He also reports another case in which a loop of intestine was caught in the abdominal suture. Up to 1881, he had had one thousand ovariectomies, with eleven cases of postoperative ileus. These all died unoperated upon.

Schroeder³ in 1878 was the first to operate for this complication. His patient died. A year later, Olshausen⁴ reported a successful case. From this time, up to 1886, very little is found in the literature upon this subject.

Ileus following laparotomy was one of the subjects for discussion at the First Gynecological Congress, held in Munich, in 1886.

In 1894, Tuja⁵ reported forty-three cases, five of which were surgical. In this same year, this subject was first brought prominently to the attention of the profession in this country by Rohe⁶ of Baltimore, in his presidential address before the seventh annual meeting of the American Association of Obstetricians and Gynecologists, at Toronto. Previous to this time, all the reported cases had followed gynecological operations. Five years later, Schade⁷ collected one hundred and twelve cases, many of which had followed operations for hernia. Corner⁸ found from his study of St. Thomas's Hospital reports during the three years 1900-02 inclusive, that more postoperative obstructions occurred following vaginal hysterectomy than from all other pelvic operations combined.

Hawkins⁹ in a study of two hundred and twenty-four cases of acute appendicitis, reports ten deaths, four from intestinal obstruction, six from other causes. Two per cent of all the cases, and forty per cent of the fatal ones, were due to intestinal obstruction.

In 1899, Werth¹¹ recommended enterostomy for the relief of intestinal obstruction.

Postoperative ileus, of which alone this paper treats differs little from ileus in general, except in the matter of causation. The diagnosis in these cases may be frequently

obscured by conditions which necessitated or were present at the time of the previous operation, infection, traumatism, influence of the anæsthetic, etc

Attempts have been made to classify ileus, but, so far, a classification that is satisfactory to everyone has not been found. In the main, the classification of ileus in general applies to the postoperative variety, but with some modifications. Classified with reference to time, Broca's division of postoperative obstructions into two classes, early and late, is good, so far as it goes. The former class includes those cases which develop before the wound is completely healed, and contains by far the larger number of cases, the latter, those which develop after a period of perfect health of varying duration. The early cases present the greater difficulties in diagnosis owing to the fact that infection not infrequently plays a prominent part in the causation of the initial operation. The diagnosis of the late cases is, as a rule, comparatively easy, because of the absence of the element of infection.

Classified with reference to causation, the Mikulicz division into two main classes, mechanical and dynamic, is perhaps the most satisfactory. These in turn may be still further subdivided. Either of these varieties when unduly prolonged tends towards the development of the other, so that not infrequently they are associated in the same individual.

The two great factors concerned in the etiology of postoperative ileus are of either mechanical or septic origin. There is still a third and much smaller class in the development of which neither of these two forces is directly concerned, namely, those rare and interesting cases of adynamic ileus having their origin in disturbed conditions of the innervation and circulation of the intestine. We would, therefore, divide postoperative ileus into three main classes,—(a) mechanical, (b) septic, (c) adynamic. But a hard and fast distinction is difficult to maintain owing to the fact that they may all be present in the same individual.

The diagnosis of obstruction is all-important. Once this

is established, the treatment is determined, since there is but one rational course to pursue. It, of course, is obvious that the earlier the diagnosis is made and the necessary relief accomplished the better. The main point to be determined in considering the question of diagnosis is, as a rule, to differentiate between the mechanical and the septic variety, since these are the two forms most often met with, the mechanical being very amenable to treatment, the septic to a less degree.

It is often difficult, sometimes impossible, to differentiate the mechanical form from the other forms of ileus, since neither condition presents any special symptom-complex which may not at times be simulated by the other. In a general way, mechanical ileus is characterized by its later onset, the presence of visible peristalsis, severe colicky pains with slight changes in the character and rate of the pulse, and little or no rise in the temperature at first, and asymmetrical distention. Where peritonitis is present, the picture is obscured, the infection masks the obstruction, the septic symptoms usually predominate. Where, following an operation, an ileus develops unaccompanied by the above-mentioned symptoms, one has probably to deal with the adynamic variety.

It goes without saying that it is important to determine the pathological condition present and its location both with reference to the portion of the intestinal canal obstructed and its place in the abdominal cavity. In some cases it is comparatively easy to accomplish both of these desired results, in other cases it is manifestly impossible.

The location of pain, its colicky character, tenderness and swelling, asymmetrical enlargement, patterns of distended coils of intestine, localized areas of dulness or tympany, character of vomitus, examination of the urine and blood, audible gurgling, etc., are all of great value taken collectively, but, individually, no one of them is of any special diagnostic significance. Colicky pains, "trouble with the bowels," distention, etc., occurring within a few days after abdominal operation, or even some months or years later, should make one suspicious

at once of the possibility of a partial or beginning intestinal obstruction, and if these symptoms continue unrelieved for any length of time, should raise the question of the advisability of an immediate exploratory operation

Since this condition when unrelieved leads to a long train of serious consequences, so far as the patient's health and life are concerned, such as disturbances in the circulation of the mesentery and bowel and their sequelæ, hyperæmia and hæmorrhage with infarct, ulceration and gangrene of the bowel, the absorption of toxines from the obstructed loop of intestine, great distention of the intestine, etc., it is of the utmost importance that every endeavor should be made to establish an early diagnosis and bring about adequate relief

As to the causation of the different forms of ileus, the early obstructions are in the vast majority of instances due directly to infection and its results. The later cases are more often due to old inflammatory adhesions which may have been drawn out into the form of bands and around or beneath which coils of intestine have become constricted. It will be seen, therefore, that the septic or adynamic forms of ileus occur more frequently in the early obstructions, while in the later ones the mechanical variety predominates

Just why inflammation of the peritoneum causes intestinal paresis, whether it is due to œdema or reflex action, vasomotor disturbances, or the local effect of the toxines upon the nerves of the intestine, is not known, but that all these factors are concerned is highly probable

The symptomatology of ileus varies with the causation. In the early cases where the possibility of infection exists, one is likely to find in certain cases symptoms suggesting peritoneal inflammation, more or less localized. It is very difficult, indeed impossible, in many cases to differentiate between a peritonitis and an ileus whether mechanical or adynamic. In fact, as has been said, one meets not infrequently with cases in which they coexist. For instance, Case II of our series, where on the fourth day after an operation for the removal of a gan-

grenous perforated appendix in which a spreading peritonitis was found present, symptoms of ileus developed. Through the wound of the previous operation I exposed and incised a distended coil of intestine, and through a rectal-tube irrigated this loop of bowel. While passing the tube into the bowel through this fistulous opening, and distending it with water from a fountain syringe, a sudden loud gurgle was heard and in a short time the patient had a free evacuation with a passage of a large amount of flatus and complete relief from his symptoms. The symptoms presented by this patient are those usually met with in cases of mechanical ileus, namely, colicky pains accompanied by distention more or less localized, visible peristalsis, and later the appearance of vomiting and obstinate constipation with marked restlessness, yet at the primary operation a well-marked peritonitis had been present. Where symptoms such as these develop shortly after a surgical operation, particularly when there has been some infection of the peritoneal cavity requiring drainage, one should be suspicious at once of the development of an obstruction. Instead of drenching the patient with cathartics, enemata and gentle massage of the abdomen, where the patient's condition admits of it, should be tried. Moderate attempts at catharsis are not contraindicated as a rule, but these failing, further efforts in this direction should be discontinued. Recourse should be had at once to other aids in establishing a diagnosis. A leucocyte count may be of some assistance, but unfortunately the leucocytes are usually found increased in the presence of intestinal obstruction as well as in inflammatory conditions. Some of the highest counts we have observed have been in this connection.

During the past few months Dr Charles E. Simon has investigated the opsonic content of the blood of a series of abdominal operations which occurred in my service at the Union Protestant Infirmary. He was particularly impressed by the very high values which he obtained in certain cases of appendicitis. Making use of his method of dilution, which

has been described in the January number of the Johns Hopkins Hospital Bulletin ¹⁰ he found that in these cases phagocytosis to the extent of from ninety to one hundred per cent may still be demonstrable with a dilution of 1 30 and even at 1 40, as contrasted with an average normal value of thirty-five for a dilution of 1 30 and of nine for 1 40. In a small number of obstructive cases, on the other hand, values were obtained which were essentially normal. I accordingly suggested that experiments be undertaken to ascertain to what extent the determination of the opsonic content of the blood might be of service in distinguishing between infective and primarily obstructive cases. This work has been conducted by Dr Nelson of the Infirmary staff in association with Dr Simon. Dogs were used for the experiments and obstruction produced by ligating the intestine with tape or broad pieces of gauze. The absolute leucocyte count, the differential count, and the opsonic content were determined before operation, and thereafter three times in the twenty-four hours until the death of the animal, or until recovery had taken place. Unfortunately the number of experiments of which I have notes is small, as the investigation was only begun a few weeks ago. The work, however, is being continued and I will probably have occasion in the future to revert to it.

From the experiments which have been made, it is clear that neither the absolute nor the relative count *per se* will suffice to differentiate a simple obstructive from an inflammatory condition of the peritoneal cavity. In one of the dogs the absolute count reached a remarkable height,—viz, 62,000 within twenty-four hours after the ligature had been applied. The relative count also did not prove to be of service. Polynuclear, neutrophilic increase associated with eosinophilic decrease, which is to be constantly met with in infections with the common pus organisms and which Dr Simon speaks of as the septic factor, was likewise met with in the obstruction experiments.

The opsonic curve on the other hand is rather interesting.

Generally speaking the values indicate fluctuations which for the low dilution of 1:10 may show a periodical increase, but on the whole there is but little deviation from what we may regard as normal for the dog. With the 1:20 dilution on the other hand, the figures are rather subnormal than normal in value. There is at no time evident a well-maintained increase such as is seen in the human being in certain infections.

As I have remarked, our series of animal experiments is as yet too small to warrant any definite conclusions, but the results obtained appear suggestive and worthy of further study.

Much importance was attached at one time to the examination of the urine. It was hoped, owing to the encouraging report of Jaffe,¹² that the presence of increased amounts of indican in the urine would be of considerable importance as a diagnostic aid but later observations have shown this substance to be present in increased amounts in certain constitutional diseases,—for instance, anæmias, starvation, empyema, cancer of the uterus and stomach, etc. In fact, it can usually be obtained in increased amount where any extensive suppurative process is present in any part of the body. Gehrhardt points out that therefore indicanuria can be of diagnostic value in intestinal obstruction only when all these other conditions can be excluded. As this test is of value only in obstructions of the small intestine, its field of usefulness is necessarily limited, and, for the reasons already stated, it is practically valueless.

Vomiting in these cases is an early and important diagnostic sign and usually becomes pronounced.

Reversed peristalsis is usually assigned as the cause of this phenomenon but the experimental researches of Magendie,¹³ Roger,¹⁴ Loevinsohn¹⁵ and others tend to discredit this assumption, and show that the abdominal muscles are very largely concerned in its production. Mall's¹⁶ interesting experiments would also rather confirm this view.

The distention noted is due to the rapid formation of gas in the lumen of the intestine. It is interesting to note that physiologists are singularly silent as to the method of gas

production in the intestine Krehl¹⁷ in his work states that the gas normally found in the intestine, and in much larger quantities in cases of peritonitis, ileus, etc., may have two sources, viz (1) The swallowed air This consists of oxygen and hydrogen, the former readily absorbed by the blood while the latter is absorbed with difficulty and is what would be found chiefly in the intestine In the meteorism of hysterical patients, he thinks this is the chief source, especially as in this condition the tonicity of the intestinal wall may be supposed to be lowered, and this would allow of greater distention (2) The gas produced by fermentation, such as hydrogen, marsh gas, carbon dioxide, sulphurated hydrogen and nitrogen The carbon-dioxide would be absorbed quickly, the sulphurated hydrogen would give an odor, but is produced in small quantity and only from proteid It would also be absorbed quickly, so that the hydrogen, marsh gas and nitrogen would be the ones likely to give rise to distention

In cases of obstruction and shock, this distention might be great, owing to the loss of tonicity in the bowel-walls, which would prevent their passing on the gas, and also prevent the normal digestion of the food and thus give a greater chance for fermentation Along with this there is also a markedly lowered power of absorption from the intestinal mucous membrane, which would augment the accumulation of gases and also retard the normal digestion of the food, leaving it a prey to the bacteria present in the intestinal canal Fermentation may thus proceed very rapidly under these conditions and the laxity of the walls of the intestine would, of course, facilitate the accumulation of gases both by preventing their onward movement and by obstructing the circulation in the intestine

In this connection and as helping to explain the restlessness and later the great prostration noticed in advanced cases of ileus, the work of Nesbitt,¹⁸ and Clairmont and Ranzi¹⁹ is most interesting Nesbitt in some experimental work conducted upon dogs in the pharmacological laboratory of the Johns Hopkins University found in complete occlusion

of the small intestine at its lower end, the constant occurrence of cholin and neurin along with other bases, provided the food ingested contained any considerable quantity of lecithin. It is not improbable, he thinks, that still other poisonous substances are formed by bacterial action from other constituents of the food in cases of intestinal obstruction. While cholin is relatively harmless in its action, neurin must be classed with the exceedingly active poisons. It has been conclusively shown by Nesbitt and other observers quoted by him that neurin may be formed from cholin by bacterial action. In its physiological effect, neurin is very like muscarin. Especially to be noted here is its paralytic action on the heart and its effect upon the intestinal movements. This work explains certain clinical phenomena observed, and proves conclusively that highly toxic substances are formed in the intestinal canal during its complete occlusion. Lavage of the stomach and intestine will mechanically lessen the amount of toxic substances absorbed.

This fact is well illustrated in Case IX of our series where on the fifth day after the removal of a gangrenous perforated appendix, symptoms of ileus developed, one of the most marked features of which was intense restlessness. After incising a distended coil of intestine through the wound, and evacuating a large amount of fluid contents and thoroughly irrigating the neighboring coils of intestine through a rectal-tube, his condition at once improved and his restlessness and delirium very quickly disappeared, accompanied by a corresponding drop in the pulse rate. Six days later, when the intestinal fistula spontaneously closed, a recurrence of these symptoms was noted, which was promptly relieved by reopening and again irrigating the intestine.

Nesbitt further points out that if the fate of lecithin in the intestinal canal, which is not definitely known, is as Broca assumes, then caution should be observed in the use of certain foods that have been considered heretofore most nutritious and healthful. Chief among these are eggs, which are rich in

lecithin and which when broken up in the intestinal canal by bacterial action may under certain conditions set free large amounts of poisonous neurin

Clairmont and Ranzi in their interesting paper point out the fact that the filtrate of normal intestinal contents injected into animals produces no results, while the filtrate from the afferent loop of an ileus produces very grave and even fatal results when injected into animals in large enough doses. These experimenters also found that the filtrate from the intestinal contents of an ileus of the small intestine possesses much more marked toxic qualities than that from the large bowel, and that the symptoms were the same in experimental ileus in animals as in the human subject. Kukula²⁰ has been able to isolate putrecin from the contents of a strangulated loop of bowel in a hernial sac. These observations all help to explain the toxæmia and paresis of the bowel observed as one of the later phenomena to develop in the course of an intestinal obstruction.

The shock and intense depression observed in the unrelieved cases is accounted for by the disturbed circulation in the obstructed portion and by the absorption from the afferent loop of poisonous toxins such as those described by these observers, in quantities sufficient to give rise to profound depression of the vital centres and at times even to death itself.

F T Murphy, of Boston (private communication), in some observations on experimentally-produced ileus in cats finds that an obstruction to the venous flow in the constricted loop was the greatest factor in producing the classical symptoms. In cases where the arterial supply was cut off, the symptoms were fairly well marked after eighteen to twenty-four hours. If examined after one-half hour, very little change was found in the obstructed loop.

In cases where the arterial supply was not cut off, but where the venous return was obstructed, there was very evident and almost immediate distress.

Within thirty minutes to an hour the animals vomited

and lost their muscular tone. These animals usually died within twenty-four to thirty-six hours. The abdomen opened one-half hour after such an operation, showed the walls of the obstructed loop markedly discolored and œdematous and much bloody fluid was found in the abdominal cavity.

Microscopically, the intestine with the obstruction to the venous return showed much more rapid and greater destruction to the mucous membrane than those with the arterial supply or the whole mesentery cut off.

Murphy thinks a vasomotor paralysis plays an important part in the production of the collapse so frequently noted in severe cases. In the production of this paralysis, the obstruction of the venous flow seems to be the important factor.

As to the frequency of occurrence of this complication, as already indicated from my own experience, and after a more or less careful survey of the literature, it can be stated that it is by no means rare. It is rather remarkable, in fact, that it is not more frequent when one considers the vast number of operations being constantly performed, and that by surgeons of limited experience, unskilled in the niceties of surgical manipulation and in the refinements of the art, where unnecessary traumatism of the exposed peritoneal surfaces is not infrequently inflicted. This, together with faulty methods of peritoneal drainage and deficient care of patients after surgical operations, makes it rather a source of wonderment that so few instead of so many cases are the subject of this grave complication. Undoubtedly some deaths are attributed to peritonitis which are due to intestinal obstruction and *vice versa*.

The symptoms of the two conditions, as pointed out by Warbasse,²¹ are so nearly identical as to make the diagnosis at times very difficult. "The clinical pictures," said he "are so similar that were it not for the peculiar symptom of the rigidity of the abdominal muscles observed in peritonitis, it is often difficult or impossible to distinguish intestinal obstruction from peritonitis. Clinically, paresis of the bowel is the

same as intestinal obstruction, and gives rise to the same symptoms "

Peck ²² points out that many of the cases of postoperative obstruction are due to kinks and bands which partially constrict the lumen of the bowel, until an attack of indigestion or some indiscretion in diet, produces an unusual gas formation in the afferent loop, with increased peristalsis acting against the point immobilized by the adhesions. The obstruction thus becomes complete and gas ceases to pass the obstructed point. This is well illustrated by Case VIII of our series. This patient was a boy fourteen years of age who twelve days after the drainage of a large appendicular abscess developed the usual symptoms of intestinal obstruction. He had been progressing favorably except for slight difficulty in obtaining a satisfactory bowel movement, when after eating heartily of fruit cake given him by a foolish mother, vomiting, visible peristalsis, meteorism and obstinate constipation developed. His leucocytes advanced from normal to twenty-two thousand. After enemata and mild cathartics had failed, the abdomen was reopened. The second incision was made through the left rectus because he referred his pain to this side and the visible peristalsis seemed to stop at this point. A kinked loop of ileum was found adherent about a small localized abscess between coils of intestine, this was evacuated and disinfected, the loop freed, and the abdomen closed. The patient made a prompt recovery.

In some cases early palliative treatment may be effective in avoiding the necessity for a secondary surgical operation. Provided the obstruction is in the large bowel, it may be possible to straighten out the kink or possibly disentangle a volvulus by elevating the patient's hips, distending the large intestine with water through a tube passed into the rectum, abdominal massage, atropine in large doses, etc. This is illustrated by two cases in my series, one of which is of unusual interest on account of the number of times volvulus has developed and been relieved in this manner.

This patient, a man, aged forty-seven years, was first admitted to the Johns Hopkins Hospital in January, 1890, with a history of definite intestinal obstruction lasting for six days. The history suggested volvulus of the sigmoid. Attempts were made to relieve by large enemata but to no avail. Dr. Halsted operated, median incision. Colon enormously distended down to the sigmoid, which was found to be the seat of a complete volvulus. No peritonitis, mesosigmoid large and broad, volvulus untwisted. Closed without drainage.

The patient had no recurrence until two years later, when he returned to the hospital with a history of obstruction of five days' duration. Enemata gave only partial relief. After several days an operation was performed, some coils of small intestine were found adherent to the line of previous incision. A long narrow band 5 mm in diameter, 15 cm long, extending from a point on the descending colon to the anterior abdominal wall. A loop of descending colon was caught behind this and almost completely constricted. The band was ligated and excised. The colon was enormously distended and mesocolon abnormally long throughout its entire length. A complete volvulus of the sigmoid was found. Recovery good.

Since that time up to January 1, 1906, the date of his last admission, he has returned to the hospital just twenty-eight times, averaging two attacks a year, for the relief of his recurrent obstruction. It has been possible in all of these attacks to relieve him completely by elevating the hips and distending the rectum and sigmoid with water. I may add that he will not agree to a radical operation directed toward preventing the recurrence, preferring to get along as he is.

The other was a youth of 19, operated upon during an attack of mild catarrhal appendicitis. The patient made an uninterrupted recovery for five days, when he began to complain of some discomfort in the bowels, which had not been satisfactorily moved up to this time. Enemata only partially effectual. Cathartics no better. On the eighth day he began to vomit and visible peristalsis was noted. Temperature slightly elevated. Abdomen moderately distended. His pain was referred to the left lower quadrant. The patient's hips were well elevated and the rectum and sigmoid distended with large enemata. Vigorous massage

and kneading of the abdomen were administered at the same time. After one-half hour of this, an audible gurgle was heard and in a few minutes a copious movement of the bowels took place, with the escape of a large quantity of flatus, accompanied with complete relief of his symptoms.

Dr Thomas S Cullen has kindly furnished me with a report of a somewhat similar case, a patient of his who ten days after an operation for diffuse peritonitis from a ruptured appendix developed symptoms of intestinal obstruction. The patient lived a long distance in the country, and three days after obstructive symptoms had developed he was removed to the city, which necessitated a long drive over rough roads with a good deal of jolting. When he arrived at the hospital his condition was better, his vomiting, which had been fecal in character, subsided, and he shortly had a succession of bowel movements with complete relief of his symptoms.

A point of considerable interest to all abdominal surgeons is the question of the formation and disappearance of adhesions in certain cases where the abdomen had been opened and found to be the seat of a well-developed peritonitis. The fact that in some cases the adhesions disappear completely and that early, and in others they do not disappear at all, or, at any rate, to a very much less extent, has been noted by many observers. The reason for this is, to my mind, not altogether clear. The presence of fluid, salt solution, effusions of one sort or another, etc., have been assigned by some as the cause for their nonappearance. Early change of position, massage, vigorous catharsis, doing away with drainage, lessening traumatism, absence of all foreign bodies in the peritoneal cavity, have been assigned by others.

I was much impressed in one case of my series by the absence of adhesions, Case XI—Dr G, upon whom I had operated three weeks previously for a perforating typhoid ulcer with the existence of a widespread peritonitis. At that time, I was in the habit (a practice which I have since discontinued) of irrigating thoroughly the peritoneal cavity and

removing by vigorous wiping with pledgets of gauze the fibrin adherent to the intestinal loops. This had been thoroughly done after a more or less complete evisceration. At the time of the second operation, three weeks later, not a single adhesion could be found in the abdominal cavity except at the point of suture of the perforating ulcer, which had adhered to another coil of small intestine and produced a sharp angulation of the adherent coil, which in turn had given rise to the obstruction.

On the other hand, in Cases IV and VII adhesions of the densest character were found matting the intestines together into a fused mass which it was impossible to unravel. All three of these cases had been subjected to the same treatment, traumatism of the intestinal coils more or less marked, well-marked peritonitis, extensive gauze drain, intestinal paresis quite well developed for several days after the initial operation, etc., with diametrically opposite results, so far as the formation of adhesions was concerned.

This brings up the question of the ability of the surgeon to limit the formation of peritoneal adhesions. My experience leads me to believe that the production of adhesions and their subsequent disappearance is a matter over which the surgeon has little control. One can do a certain amount toward preventing their formation, but it is impossible to prevent them altogether. Sonnenberg, quoted by Loevinsohn, is of the opinion that toxins passing through the intact bowel-wall give rise to adhesions in those cases where they are present without demonstrable lesion.

Baisch reports a series of experiments upon animals intended to show the causation. He produced a variety of lesions of the peritoneum, parietal and visceral. He concludes from his observations that the formation of adhesions is dependent upon the presence of blood, even in minute quantity, in the peritoneal cavity. He conducted two series of experiments, producing similar lesions in each. In the one complete hæmostasis was employed. In the other, varying amounts of blood were allowed to remain in the peritoneal cavity. In the first

series, no adhesions developed, while in the other they were constantly found present

In support of this proposition, he quotes the statistics from Zweifel's clinic, noted for his blood-free technique, who, in eight hundred laparotomies, had only two cases of postoperative ileus, both of which occurred in cases exhibiting extensive adhesions at the time of the primary operation

Martin has recommended the application of sterile oil to the denuded areas

Cargile membrane has a very limited usefulness The presence of fluids,—for instance, salt solution, in the abdominal cavity is of doubtful efficacy owing to the rapidity of absorption

W J Mayo's²³ suggestion that the presence of fluid in the abdomen prevents the formation of adhesions in the case of tuberculous peritonitis is probably correct, but in that disease the fluid is in quite large amount and remains for a long time The two conditions are hardly analogous

The limiting of the amount of packing and the use of materials which least excite adhesive peritonitis are to be recommended It is well to avoid drainage altogether where possible, but, in case it is necessary, the greatest care should be exercised in the proper placing of the drain If a drain can be so placed as to be surrounded on the one side by visceral and on the other by parietal peritoneum, the chances of the formation of obstructive adhesions are much lessened

Early catharsis, recommended by some, is of questionable value In fact, it seems to me to be contraindicated in a considerable number of cases The early rather extravagant claims of the advocates of atropine and eserine have not been borne out by more extensive observations Frequent change of position may be of advantage in certain conditions It is obviously impossible in others For instance, in that interesting group of cases of dilatation of the duodenum and stomach, gastromesenteric ileus (of Zade) due to obstruction of the duodenum by the superior mesenteric vessels, associated

with Glenard's disease, it is indicated. In one of the fatal cases of my series, this was the cause of death.

This patient, a woman, aged forty-six, had been operated upon eighteen months previously by another surgeon for some pelvic trouble. On September 7, 1904, I did a pyloroplasty for persistent indigestion, nausea and vomiting. The pylorus was somewhat contracted with a scar on the anterior wall. The stomach moderately dilated, pylorus and duodenum high up under the liver. The patient began vomiting after recovery from ether. This persisted unrelieved for seven days in spite of lavage, etc. Vomitus odorless, bile-stained. Pulse rapid, weak throughout. Bowels moved well. Patient had slight cough. Died seven days following operation.

Autopsy showed beginning bronchopneumonia of left lung. Suture perfect, no sign of peritonitis, stomach moderately dilated, the first portion of the duodenum markedly so up to the point where it passes beneath the mesenteric vessels. Below this point the intestine was collapsed. On opening the intestine at this point, no lesion was found. Small intestine was pushed well down into the pelvis. Had a diagnosis of the cause of the ileus been made earlier, a change in position might have brought about relief.

It would lead us too far afield to discuss at this time this most interesting variety of ileus, originally described by Rokitsansky²⁴ in 1842, and which has of late begun to attract attention among abdominal surgeons, but it is a fact worthy of note in passing that Dr. Byron Robinson,²⁵ of Chicago, in 1900 appears to have been the first one in this country to bring this condition to the attention of the profession in a publication. In a recent communication to the Johns Hopkins Medical Society, I gave credit to another, but on further investigation, I believe it properly belongs to Dr. Robinson, and I take this opportunity of correcting my former misstatement. Those who are interested, I would refer to Dr. Robinson's original article in the Cincinnati Lancet Clinic, December 8, 1900, and to the recent reviews of the subject by Zade,²⁶ Kelling²⁷ and Neck.²⁸

From a study of my own series, it would appear that obstruction occurs in the majority of cases early,—that is, before the patient leaves the hospital, fourteen occurring early and twelve late, according to Broca's classification. The disparity in number between the two groups, however, does not seem to be as great as one would naturally suppose. Of the fourteen early ones, ten occurred within the first week, all within three weeks. Of the late cases, five occurred within six months and three were over five years.

Of my series of twenty-six cases, twenty-two were operated upon a second time for obstruction. Appendicitis, acute or chronic, seems to have been the most fruitful cause. Sixteen or 61.5 per cent followed appendicitis, either acute or chronic. Two followed operations for strangulated hernia, two typhoid perforation, two cholelithiasis. One case each followed operations for pyloroplasty, tuberculous peritonitis, volvulus and nephrotomy. The last was the only case of my series in which the peritoneal cavity was unopened. Although only two cases of my series were associated with hernia, it is a very important etiological factor, as pointed out by Schede.

A most interesting case of postoperative obstruction has recently occurred in the Surgical Clinic at the Johns Hopkins Hospital. The patient, an old man, upon whom perineal prostatectomy had been performed by the house-surgeon, Dr. Sowers, gave a history of having had a right inguinal hernia for forty-five years and one on the left for four years. The note at the time says "a double inguinal hernia most marked on the left side. Easily reduced." During the operation for prostatectomy, both herniæ were reduced. The patient stood the operation well but vomiting began within a few hours. This continued in spite of lavage and rectal feeding. Abdominal pain was pronounced. Most of his pain was referred to the bladder and supposed to be due to the operation. Constipation was present, no result from the enemata.

On the second day it was noticed that the amount of urine was much diminished. It was supposed then that his trouble was due to suppression of the kidney function. His condition

remained practically unchanged up to the time of his death, on the fifth day. His abdomen was only moderately distended and nothing specially noted here. It was supposed his death was due to suppression of urine and asthenia.

The autopsy showed a cloudy swelling of the kidneys. Marked arteriosclerosis. Intestinal coils were distended and pale except a number of coils in the right iliac fossa, which were dark red, the small intestine collapsed for a considerable distance from the ileocaecal valve. At this point a volvulus was found with a twist of one and one-half turns. On untwisting the intestine, the mesentery was found thickened and coils of intestine adherent to each other, and to the thickened mesentery by old fibrous adhesions, the reduction of the adherent hernial loops *en masse* had produced the obstruction. The diagnosis was obscured in this condition by the absence of signs referable to the hernia, the subjective symptoms all referred to the bladder.

The cause of obstruction was kinking in seven cases, adhesions alone, seven, bands, three, volvulus, two, loop caught beneath adherent loop, one, cicatricial stenosis, one, gastro-mesenteric ileus, one, adynamic ileus, one, cause unknown in three. In twenty-three of the cases the cause of obstruction was definitely known. Of these, in eighteen, or 78 per cent, the obstruction occurred either directly or indirectly as the result of peritoneal adhesions. It will thus be seen that of all the factors concerned in the causation of intestinal obstruction, peritoneal adhesions exercise by far the greatest influence.

The seat of the obstruction was in the small intestine in twenty cases, within the lower twelve inches of the ileum ten, exact position not stated ten, pylorus or duodenum three, sigmoid two, ascending colon one.

Peritonitis more or less general was present at the time of the primary operation in fifteen cases. At the time of the secondary operation it was found present in eight. It was the cause of death in three of the fatal cases. The treatment employed was freeing of the adhesions in nine cases, enter-

ostomy in nine, primary intestinal anastomosis in two, exploratory laparotomy, nothing done, in two, no operation in four

Of the fatal cases, four died without relief from the obstruction, three from peritonitis, and three from symptoms suggesting toxæmia

That drainage plays a very important part in the development of postoperative obstruction is agreed by all surgeons. It is somewhat surprising then to note that of our series, sixteen cases were drained, whereas ten, 38.4 per cent, were not drained. Drainage, therefore, is not the only factor to be considered.

Enterostomy was performed nine times, in three instances it was followed later by a secondary anastomosis. Of these cases, four recovered and five died. The value of enterostomy in intestinal obstruction is as yet undetermined, but that it has a place and that it is a life-saving procedure in many instances cannot be gainsaid. That it has obvious objections, is equally apparent. In a recent communication by Dr. Pancoast and myself²⁹ we have called attention to some of its advantages. That I have saved life by the establishment of an intestinal fistula where more extensive operation was out of the question, I am perfectly convinced.

Where bands exist they should be excised, adhesions should be freed and the intestinal coils placed in as favorable position as possible to prevent obstruction from the formation of subsequent adhesions. Where the bowel has been injured and its viability is doubtful, it is better when possible to do immediate resection followed by anastomosis. This is illustrated by Case XXI, whom I operated upon for a strangulated femoral hernia. The bowel looked a bit doubtful, but owing to the patient's poor condition I deemed it wiser to take the chances and dropped the injured loop back into the abdominal cavity. She made a good recovery, but began to complain, after a few weeks, of symptoms of intestinal obstruction. These increased in severity until the obstruction became almost complete. Seven months after the initial operation, I reopened

the abdomen and found an obstruction of the intestine due to a tight cicatricial contraction at the point where the bowel had been found constricted at the previous operation. The lumen at this point was not more than 5 mm in diameter. I did a lateral suture anastomosis. She made a good recovery.

In my series, there was but one case of adynamic ileus unassociated with peritonitis and this was the only case in which the peritoneal cavity was unopened.

This patient, a man aged forty years, suffering from persistent hæmorrhage from the right kidney, was operated upon by another surgeon. I was present at the primary operation, which was very well done, no undue traumatism having been inflicted. The kidney was exposed without much difficulty, incised and drained. The patient stood the operation well but took the ether rather badly. Shortly after the operation, a moderate amount of meteorism developed, which persisted for four days in spite of all efforts to overcome it. During this time there was no movement of the bowels and vomiting had been persistent and most distressing. The vomitus was chiefly bile-stained fluid, containing no fecal odor. At the end of this time, the patient's condition becoming distinctly worse, it was thought best to explore.

I opened the abdomen on the fifth day and after a careful exploration of the entire abdominal contents, could find nothing except a universal distention of the intestinal tract. It seemed perhaps a little more marked in the ascending colon than elsewhere. There was no sign of peritonitis. A rectal tube was passed and a considerable amount of gas and feces was syphoned off by stripping the intestine downward in the direction of the fecal current. This was followed by only temporary relief, meteorism recurring on the next day. An enterostomy was performed in the hope of relieving the distention, but it was of no avail. Apparently an infection of the peritoneal cavity occurred at the point of the enterostomy wound, for some days later the patient died with symptoms of peritonitis.

Autopsy showed a fresh peritonitis starting from this point, grafted upon a universal distention of the intestinal coils. This

was the only death in my experience that could in any way be traced to infection from the enterostomy opening

As has been said before, postoperative ileus other than the mechanical variety is most frequently associated with an inflammation of the peritoneum, more or less widespread. That a circumscribed peritonitis will stop peristalsis cannot be denied. Just how this is brought about is not definitely known, but that it is at times observed associated with a very sharply localized peritonitis of a low grade, is illustrated by a case reported by Dr Halsted³⁰. This patient was operated upon for gall-stones. At the operation there was found an ileus of the first portion of the duodenum and the pyloric end of the stomach. Corresponding accurately to this distended portion of the bowel, was a slight peritonitis scarcely more than an injection of the serosa and an exudate only enough to cause very slight adhesions between the duodenum and gall-bladder. The vascular injection seemed to correspond accurately to the limits of the dilatation.

Disturbances more or less marked to the innervation and circulation of the bowel-wall are certainly important factors in the causation of these forms of ileus, but, in addition to this, it is highly probable that the absorption of toxins, as referred to earlier in this paper, from the obstructed portion of the bowel, plays a most important part, the full significance of which is not at present understood.

Reichel³¹ has shown by experiments that artificial kinking of the intestine is of itself not enough to produce complete occlusion, but in addition there must be a surrounding peritonitis. He concludes that the greater number of such instances have peritonitis as the primary factor. Over-distention by large and frequently repeated enemata has been known to be followed by temporary intestinal paresis.

CONCLUSIONS

(1) Broca's classification into early and late varieties simplifies the diagnosis. In the former class, which so fre-

quently is associated with peritonitis, the differential diagnosis as to variety is always difficult and often impossible. In the latter, which is composed almost exclusively of the mechanical form, it is usually easy.

(2) Adhesions are the chief factor to be reckoned with in an attempt to prevent the occurrence of postoperative ileus, and efforts directed toward this end are likely to be productive of the best results.

(3) That drainage exercises a marked influence in the production of adhesions cannot be denied.

(4) Treatment—Prompt operation is indicated in every case after palliative measures have been given a fair trial and have failed. The character of the operation depends upon the nature of the obstruction and the condition of the patient.

(5) The prognosis is unfavorably influenced by the presence of infection. In its absence, it is excellent.

REPORT OF CASES

CASE I—Mr M, aged 47, admitted January 9, 1890. History of obstruction of one week's duration. Volvulus of the sigmoid, mesosigmoid very long and broad. Gut untwisted and wound closed, without drainage.

Second admission, December 22, 1892. Similar symptoms as at previous operation of five days' duration.

Operation, December 29, 1892—Small intestine adherent to the anterior abdominal wall at a distance of 10 cm. Long narrow band extending from a point on the descending colon to the anterior abdominal wall behind, where a loop of large intestine was caught. There was also a double volvulus of the sigmoid. This was untwisted, the band ligated and the abdominal wound closed. The patient was subsequently admitted twenty-eight times for obstruction. It has been possible in all of his subsequent attacks to relieve him by high enemata.

CASE II—Mr H, aged 53, admitted February 29, 1904, with symptoms of acute appendicitis and spreading peritonitis. Operation, appendectomy, irrigation of the abdominal cavity with salt solution, iodoform gauze drainage to the stump of the appen-

dix and to the pelvis. About the fourth day he began to show symptoms of intestinal obstruction and an opening was made through the old incision into the intestine. On passing the rectal-tube into this opening, an obstruction was encountered, which gave way with immediate relief to the patient. The intestine was washed out and there was no further trouble. Fistula closed spontaneously.

CASE III—Miss F, aged 42, had been operated upon twice previously, the first operation being for ventral fixation, the second for appendicitis (chronic).

At the second operation a McBurney incision was made and a chronic appendix was removed. A few fine adhesions around the right ovary. The wound was closed without drainage. Except for a slight constipation, the patient was well for seventeen months following the second operation, then she began suddenly to have severe abdominal pain after a full meal. This rapidly became worse, temperature and pulse remained normal. The abdomen was tense and quite hard, gurgling could be heard occasionally but no visible peristalsis. There was tenderness in the right iliac fossa. No vomiting. An enema gave no results.

Operation—Right rectus incision, 12 inches of small intestine was found black and with a very foul odor. This was produced by a loop of intestine becoming adherent by a band to the region of the sigmoid, and with this as a centre a volvulus had taken place. The lower portion of the involved intestine was 6 cm from the ileocaecal valve. The affected intestine was resected, an end-to-end anastomosis performed, and the wound closed without drainage.

The patient made a good recovery.

CASE IV—Mr M, aged 28. Primary operation, appendectomy and drainage for acute appendicitis and general peritonitis. Right and left rectus incisions. Gauze drainage. Eighteen months after he developed symptoms of obstruction following a hearty meal. When seen twenty-four hours after the onset, there were colicky pains, distention, nausea and vomiting.

Operation—The intestines were found much matted together by extensive adhesions, making it impossible to locate any definite point of obstruction. The most distended loop was brought into the wound and opened. The patient's condition

became very bad on the table and he died twenty-four hours later unrelieved

CASE V—Mr D, aged 16, admitted May 15, 1903 Primary operation, appendectomy and drainage of an appendix abscess for acute gangrenous appendicitis Six months later the usual symptoms of obstruction appeared

Operation—One loop of ileum was found adherent posteriorly in the region of the cæcum Another loop had slipped under this, producing an obstruction The adhesion was freed, the loop beneath found in good condition and the abdomen closed without drainage

Good recovery

CASE VI—G W, aged 13, admitted May, 1902 Primary operation for acute appendicitis and general peritonitis Appendectomy and gauze drainage

Two years later he was taken with severe pain in the abdomen, of a crampy character, which had been present two days before admission Vomiting had been persistent, abdomen distended, pulse 100, obstipation

Operation—A band was found extending from the scar to a loop of small intestine, which was partly twisted around it, causing an obstruction Two other bands were found extending from the scar to other coils of the intestine but doing no harm These were all resected and the abdomen closed

Good recovery

CASE VII—Mr B, aged 20 Primary operation, appendectomy for acute perforative appendicitis and general peritonitis Large amount of gauze drainage Patient has had four or five attacks since operation similar to the present one, last one six months ago

Three days before admission he was taken with sudden cramp in the abdomen in the region of the old scar Has vomited since the onset Pulse and temperature have been normal, bowels have moved slightly with enemata There has been no visible peristalsis There is some deep tenderness to the right and above the umbilicus on palpation

Operation—Numerous loops were found adherent one to the other No definite point of obstruction could be found One acutely inflamed loop was left in the wound, packed about with

gauze Four days later an enterostomy was done at this point One month later, a secondary laparotomy was done, but on account of the condition of the patient and the difficulty in locating the obstruction, a lateral anastomosis was made between loops above and below the mass of adherent intestine

Good recovery

CASE VIII—H H, aged 14, admitted November 12, 1905 Primary operation, drainage of appendix abscess, appendix not found Bowels moved well after the operation Twelve days after the operation the patient began to complain of pain at intervals in left lower abdomen At the time of the occurrence of a paroxysm of pain, there was tenderness in this region but not between There was slight fulness of the abdomen on the left side, visible peristalsis was present

On the following day the patient vomited quite frequently and peristalsis was much more marked Enemata were ineffectual No rise in pulse rate or in temperature

Operation—Left rectus incision, loop of small intestine was found kinked upon itself by some adhesions which had formed between it and the wall of the old abscess cavity These were freed and the abdomen closed without drainage

Good recovery

CASE IX—Mr W, aged 54, admitted October 31, 1904 Primary operation, appendectomy for acute perforative appendicitis and localized peritonitis, iodoform gauze drainage Third day after operation, began to complain of distention and had some vomiting, which was relieved for the time being by stomach washing On the fifth day symptoms of intestinal obstruction became more evident, vomiting had continued, enemata were only partially effectual, and restlessness had become a marked feature Pulse at this time, 140

Operation—Enterostomy through the old wound A large amount of fecal matter and gas was expelled and the intestine was washed out with salt solution Following this, the patient's condition improved Six days later the fistula closed with a return of the former toxic symptoms Reopening the fistula resulted in almost immediate improvement

Third operation, twenty-one days after primary operation—A kink was found in the lower portion of the small intestine, due

to adhesions about the original wound. This was freed and the abdomen closed. Following this, however, the patient did very badly and although infused and stimulated, died twenty-four hours later.

CASE X—Mrs T, aged 39, admitted May 14, 1904. Primary operation, appendectomy for acute appendicitis and spreading peritonitis. Iodoform gauze drainage. The patient continued to vomit for thirty-six hours after the operation. There was a slight movement of the bowels on the second day. On the third day, however, vomiting again began and was persistent. The abdomen was symmetrically distended, enemata were entirely ineffectual, there was only a slight rise in the pulse rate.

Operation—A distended loop was found in the old wound and opened. Irrigation into the efferent loop came out of the rectum, and it was found impossible to irrigate the afferent loop. Four hours later, under ether anæsthesia, the abdomen was opened through a left rectus incision. A distended loop was opened and the intestine emptied of its contents. It was then fixed in the abdominal wound. The patient was relieved in a short time. The enterostomy opening on the left side closed spontaneously, that on the right was closed by a lateral anastomosis five weeks later.

CASE XI—Dr G, aged 25. Primary operation, laparotomy for typhoid perforation and spreading peritonitis. Iodoform gauze drainage. The patient had made a good recovery, and had been sitting up for two or three days, when the signs of an obstruction began to develop. This was between three and four weeks after the primary operation. There was pain, nausea, vomiting, asymmetrical swelling of the abdomen, much more marked upon the left than on the right side.

Operation—A band was found stretching across from the old scar to the left lateral abdominal wall, obstructing beneath it a loop of small intestine. The band was resected with relief of the obstruction.

Good recovery.

CASE XII—Miss R, aged 24. Primary operation, appendectomy for chronic appendicitis. McBurney incision. Particular care was taken to turn in all raw surfaces and the meso-appendix. Six months later, the patient had symptoms of

obstruction while at home in a distant city Operation at that time by a local surgeon demonstrated an obstruction in a loop of small intestine due to kinking from an adhesion to the stump of the appendix Adhesion divided and the abdomen closed

Good recovery

CASE XIII—Mr L, aged 35, admitted February 4, 1902 Primary operation, appendectomy for acute perforated appendicitis and localized peritonitis Iodoform gauze drainage The patient did not do well, there was no distention, but bowels could not be moved and he suffered from constant nausea and vomiting By the end of twenty-four hours he was vomiting almost continuously, large quantities of dark material being expelled every few minutes without effort Lavage of the stomach afforded no relief The face was drawn and pinched

Operation—A distended coil of intestine was opened through the old wound Large amount of foul-smelling material escaped Following this, the patient did well Four months later, a lateral anastomosis was done to close the fistula

CASE XIV—Mrs S, aged 80, admitted February 1, 1905 Primary operation for gangrenous appendix Iodoform gauze drainage Second operation four months later for strangulated left femoral hernia Six years after the primary operation, the patient was seized with severe abdominal cramps, nausea and vomiting which persisted for five days Constipation had been present during this time There had been no fever at any time When seen by me, abdominal distention was marked, asymmetrical, being most pronounced in the right lower and left upper quadrant The vomitus consisted of bile-stained mucus

Operation—On opening the abdominal cavity, the right lower quadrant was found filled with a sticky sero-purulent fluid At the upper portion of the incision this was slightly bile-stained On continuing the incision up toward the costal margin, the presence of bile became more pronounced No perforation of the gall-bladder or ducts could be found Intestines were everywhere distended and covered with lymph Adhesions very pronounced, especially in the right lower quadrant, where an obstruction at the ileocaecal valve was made out The patient's condition at this time became so grave that the operation was discontinued and the abdomen closed She died a short time later

CASE XV—Mr P, aged 21, admitted August 19, 1902 Primary operation, laparotomy for typhoid perforation Small perforation in the ileocæcal valve, closed with silk suture Abdominal cavity irrigated with hot salt solution Iodoform gauze drainage placed in the pelvis The patient's condition the next day was very satisfactory, tenderness and muscle spasm over the abdomen were much less At eleven o'clock P M the patient complained of abdominal pain and vomited, had slight movement of the bowels following enemata Cramp-like abdominal pain complained of occasionally The next morning, his condition not having improved, the abdominal wound was opened, gauze drainage removed and a distended loop brought into the abdominal wound, packed off with gauze and opened The bowel was irrigated in both directions and a large quantity of fecal matter was washed out The stomach and rectum were also washed out Following this, the patient's condition seemed to improve and that night after the stomach, intestine and rectum were irrigated, the patient was decidedly relieved This improvement continued for two days On the following day he became worse, temperature and pulse both being elevated, and, in spite of all efforts toward stimulation, died two days later

Autopsy showed a perforation 15 cm from the ileocæcal valve which had been sutured but from which there had been some leakage This, however, had been entirely walled off by adhesions which had produced a sharp kinking of the ileum at this point There was no general peritonitis

CASE XVI—Mr S, aged 40, admitted January, 1906 Primary operation, nephrotomy and drainage for hæmorrhage from the right kidney Lumbar incision Peritoneal cavity not opened, patient came into the hospital morning of the operation, and bowels did not move with an enema Vomited considerably more after ether than is usual and at intervals on the following day The next day the vomitus began to have a brownish color and slight odor There was considerable distention but no visible peristalsis Up to this time, an enema had been ineffectual In the afternoon of the second day quite a quantity of fluid fecal matter came through the rectal tube On the third day, the distention became more marked, nausea and vomiting still present, and there was visible peristalsis The patient became very restless and the pulse more elevated No movement of the bowels

On the fourth day the abdomen was opened and the small intestine found everywhere distended and also the cæcum. The transverse colon and sigmoid were collapsed. Some adhesions about the hepatic and splenic flexures were broken up, but these seemed hardly enough to produce the symptoms. A distended loop of small intestine was fixed in the wound with gauze. The next day, as the patient's condition was no better, the intestine was opened, with the escape of gas but no fecal matter. Attempts at washing out the intestine were unsuccessful, as it was found impossible to pass the stomach-tube for any distance. There was some improvement for thirty-six hours following the evacuation of gas but no relief of the obstruction, and the patient died four days after the secondary operation.

Autopsy showed a pretty widespread peritonitis with the lower six inches of ileum tightly bound down by adhesions, producing a stenosis in that region.

CASE XVII—R J, aged —, admitted May 9, 1903. Primary operation, appendectomy for perforated appendix with extensive spreading peritonitis. Gauze drainage to pelvis and stump of the appendix. Three months later the patient returned with symptoms of partial obstruction, crampy abdominal pains and vomiting at intervals. Bowels moved only slightly with enema.

Operation—A number of adhesions were found between the neighboring coils, no definite kinking or other form of obstruction. Adhesions freed and abdomen closed.

Good recovery.

CASE XVIII—M₁ McL, aged 19, admitted December, 1905. Primary operation, appendectomy for appendicitis probably associated with influenza. Wound closed without drainage. The patient did well until the fifth day, when after an attempt to move the bowels with cathartics and enema he developed pain in the left side with asymmetrical distention over this area. As his symptoms were not violent, further efforts were made to relieve the bowels during the next day. On the seventh day, distinct patterns were seen in the left side. Paroxysmal pains occurred, with audible gurgling, the distention had increased.

Treatment—The patient's hips were then well elevated, the rectum was distended with several litres of water through a

rectal-tube passed high Vigorous kneading of the abdomen was practised An audible gugle was heard followed at once by copious fecal and gaseous discharge, with complete relief of symptoms

CASE XIX—M₁ F, aged 28, admitted August 25, 1902 The patient had a history of a previous attack of appendicitis, the last one being three weeks ago, and he came into the hospital for an interval operation Operation—Appendix found very adherent, running down into the pelvis In freeing the tip a small abscess cavity was opened, necessitating the use of iodoform gauze drainage Upon the second day following the operation he began to complain of distention and pain Enemata have given no results, pulse slightly elevated By the fourth day the distention was still present but the patient had had in the meantime six small stools, he has been vomiting occasionally, restlessness has been marked and the pulse has risen to 130

Operation—A kink in the small intestine was found near the situation of the drain, this was relieved A loop of the ileum was then fixed in the abdominal wound, as the patient's condition was such that the operator did not feel warranted in searching for further obstruction The patient was much shocked when taken off the table and did not recover, although the intestine was opened and washed out shortly after operation

CASE XX—Mrs H, aged 46, admitted September 4, 1904 Primary operation, pyloroplasty for gastric neurosis and gastrop-tosis The pylorus was slightly contracted and there was a wide scar on the anterior wall Following the operation, the patient did badly, vomiting began shortly after the recovery from ether and persisted continuously for seven days until death Vomitus had no odor and was usually green in color Pulse remained rapid and weak throughout the whole period Bowels had moved well

Autopsy, anatomical diagnosis, partial obstruction of the duodenum and early bronchopneumonia of the left lung Cholelithiasis, myomatous uterus There was no leakage about the suture and no evidence of peritonitis The stomach was moderately dilated, the duodenum considerably To the right of the position where the duodenum passed beneath the greater mesenteric vessels it was dilated To the left it was contracted The sigmoid and ascending colon up to the hepatic flexure was dilated

No obstruction at the position of the anastomosis This finding suggests the possibility of a partial obstruction of the duodenum beneath the mesenteric vessels as a cause of death

CASE XXI—Miss B, aged 45, admitted September 7, 1905 Primary operation, six months ago, for a radical cure of strangulated left inguinal hernia No drainage Ever since the patient left the hospital, she has had some general abdominal pain, slightly more marked on the right side below the level of the umbilicus Has had indigestion and vomiting when the pains are severe Constipation has been a marked symptom Upon examination, a hard mass appeared close to the surface of the abdomen somewhat to the right and disappeared with an audible gurgle

Secondary operation—Lapatoromy Cicatricial stenosis was found in the small intestine where it had been caught in the hernia sac at the time of the strangulation A lateral anastomosis was done to short-circuit this area

Good recovery

CASE XXII—Miss G, aged 41, admitted May 24, 1902 Primary operation, radical cure for right femoral hernia Following operation there was nausea and vomiting for two days On the second day bowels moved with an enema, the patient ceased vomiting and was much more comfortable On the fourth day vomiting began again and it was impossible to move the bowels with an enema Pulse rose to 140 On the fifth day there was marked distention, pulse 160, vomiting had ceased Bowels had not moved

Operation on the fifth day—Numerous adhesions were found about the appendix and sigmoid and lower loops of the ileum In suturing the sac of the femoral hernia the parietal peritoneum had been pulled upon where it was adherent to a coil of small intestine and thus produced a kink

The patient died on the table

CASE XXIII—Mr F, aged 28, admitted June 1, 1905 Primary operation, six years ago, acute appendicitis No drainage He was well for two or three years For the past three or four years he has complained of attacks of crampy pain in the right side, radiating to the umbilicus and right leg The attacks varied in duration from a few hours to a few days There is considerable belching after meals and borborygmus No nausea

or vomiting. Attacks have increased in frequency during the last few months

Operation—Numerous dense adhesions about the sigmoid and lower ileum. Very dense adhesions between the omentum and anterior surface of the sigmoid. These were divided and the wound closed.

Patient made a good recovery.

CASE XXIV—Mr S, aged 60, admitted September 12, 1903. Primary operation, cholecystostomy and drainage for stone in common duct. Large amount of iodoform gauze was used. For the first few days, the patient did not do very well. Had more than the usual amount of pain and discomfort and pulse remained elevated. On the tenth day he began to feel nauseated and vomited. Had been slightly delirious at times. From this time until the time of his death on the forty-first day after the operation, the patient was constantly nauseated and vomited almost every day. The vomitus was clear and colorless. The bowels moved every other day.

At autopsy there was found a twist at the pylorus, making an almost complete obstruction at this point.

CASE XXV—Mr B, aged 44, admitted July 1, 1903. Primary operation, cholecystotomy for stones in gall-bladder, cystic and hepatic ducts. Drainage consisted of tube in common duct surrounded by large amount of iodoform gauze. Did fairly well up to the seventh day, when he began to be slightly nauseated and drowsy. Following this, he became better for about ten days, but was only able to take liquid nourishment. On the twenty-second day he began vomiting again with no relation to time of taking nourishment. The vomitus was slightly blood-stained. This condition continued up to the forty-fourth day, when he died. The symptoms were practically the same as those in the preceding case. No autopsy.

CASE XXVI—Mrs C, aged 37, admitted May 17, 1901. Primary operation, five months previously, for intestinal obstruction due to tuberculous peritonitis. The obstruction was found to be due to adhesions of neighboring coils. These were separated and the wound closed.

Second admission—The patient had been well up to three weeks ago, when she began to have uneasy sensations in the abdomen and constipation became more marked. Two days ago

she had severe pain in the epigastrium, with nausea and vomiting. The abdomen became tense and hard, but there was only slight distention. During the night of the second day the vomitus became fecal. Pulse on admission, 104.

Operation—The tuberculous process had improved markedly. The obstruction was found to be due to two bands which had caught and tightly bound a coil of intestine. These were ligated and divided and other bands which were thought might give trouble were also divided. The peritoneal cavity was irrigated with salt solution and the abdomen closed.

Good recovery.

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BACKWARD DISLOCATION OF THE SECOND CARPO-METACARPAL ARTICULATION.

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As this form of injury is an extremely rare one I desire to place this case on record. Dislocation of two or more of the metacarpals upon the carpus is not an extremely rare injury. Burk has collected the records of 24 cases of this variety, which includes dislocations of all of the metacarpals, complete, incomplete forward and backward.

Hamilton, in speaking of this injury in his work on "Fractures and Dislocations," says "Examples of these accidents are so rare that no attempt will be made to establish systematically the causes, symptoms or treatment."

Dislocation of the proximal end of the *first* metacarpal is not an uncommon injury. Boyer reports 16 cases, 11 of which were incomplete and 5 complete. I have only been able to find record of three cases similar to the one which I have to report. One is reported by Hamilton, that of a woman aged 28, the injury was produced by a fall upon the closed hand, and he says "reduction was easily accomplished." Humbert reports a case in a man who was driving a horse which kicked him upon the hand which was holding the reins, and he says "Reduction was easily accomplished by traction and pressure." Roux reports a case, according to Hamilton, of this variety produced by an explosion in a mine. Stimson, in his work, refers to the same case as one of dislocation of the second and third metacarpals. Stimson reports 2 cases of forward dislocation of this bone, one of these was the result of severe pressure on the back of the bone, the other the result of a blow from a hammer upon the back of the hand. Isolated cases have

been recorded of dislocation of all of the metacarpals upon the carpus with the exception of the fifth

Considering the fact that in my cases reduction was impossible by traction or manipulation, and from the fact that in the cases cited "reduction was easily accomplished by traction and pressure," I am led to conclude that they were in reality cases of incomplete dislocation

The case which I have to report is that of a man, W R, aged 26, who in getting off a railway car fell from the platform to the ground, striking upon the left-side arm and hand, there were no marks of violence upon the hand Examination showed a prominence of the proximal end of the second metacarpal bone upon the dorsum of the hand, the outline of the end of the bone being easily made out Traction and manipulation were faithfully used, but reduction could not be accomplished, incision was made, when it was found that we had a complete overlapping of the end of the metacarpal bone upon the trapezoid Reduction could only be done by inserting a chisel under the end of the metacarpal and prying it down into place, which was accompanied by a distinct snap which could be plainly heard by those in the operating-room I do not believe that reduction could have been accomplished in this case by any kind of manipulation There was no tendency to recurrence of the deformity, as was said to have existed in one of the cases above referred to

CORNU CUTANEUM OF THE HUMAN SCALP

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ONE of the rarest and most curious classes of tumors to which the human organism is subject, is horns, especially multiple horns, of the scalp. In ancient times, when idolatry and superstition reigned supreme, these growths were considered symbolic of wisdom and power. In Michael Angelo's painting of Moses, two horns adorn (?) the patriarch's head. This single fact would indicate the infrequency of the anomaly even in ancient times.

Horns of the human scalp are usually single, they differ from those in animals by being non-uniform in size, shape, etc. No part of the human body is exempt from their invasion, but in perhaps half of the cases they involve the scalp. In reviewing the available literature we did not find more than two cases in which two or more separate horns appeared at the same time in an individual scalp. In no instance did we find a case in which two separate horns of the scalp were associated with a cutaneous cancer of the nose, and in which numerous sebaceous cysts of the scalp were also present, as occurred in our case.

Bland-Sutton describes (1) sebaceous horns, (2) warty horns, (3) cicatrix horns, and (4) nail horns. He regards them of not infrequent occurrence, although Crocker contends that they are very rare. In Robert's interesting case the horn grew from a wart on the cheek of a woman seventy-five years of age, while that reported by McLeod developed from the base of a wart on the chest and attained a length of two inches

Shaw saw a patient fifty-six years of age with a cutaneous horn of the lower eyelid. Six years previous to its appearance he observed a small pimple upon the lid. A fine, hard, hair-like growth appeared on the surface and gradually assumed the appearance of a horn, eighteen months later it dropped off, leaving a pimple the same as before, later the horny growth returned and became two inches long. Whishow's patient possessed a horn which developed from a tubercle in the scalp. It attained a length of two inches. In Bellamy's patient the horn grew from the clitoris and resembled the claw of a lion. The largest horn that has been found in a human was that of Paul Rodriguez, it grew upon the side of the patient's head, and was fourteen inches in circumference, and was divided at the apex into three shafts. In the museum of the Medical Department of Washington University is a cast of a cutaneous horn of the scalp. The horn was six inches in length and grew from the forehead. The cast was brought from Paris by Dr. Pope. In Soubervielle's patient the horn was ten inches long.

Cutaneous horns have been found in mice, birds, and other members of the lower animals in which horns are uncommon. Bland-Sutton has presented a sketch of a cutaneous horn in a mouse found in Westminster Abbey. Sutton has also referred to a very interesting case of horn which grew from a scar resulting from a burn. The latter is especially interesting since Spietschka has contended that no true horn can be formed if there be no papillæ in that part of the skin.

Etiology—It is quite certain that the true etiology depends on several factors. Most authorities are non-committal. The predisposing factor seems to be a wart, a sebaceous cyst, a scar, or a nail. The exciting factor may be a blow or anything that causes certain changes in the skin-tissue whereby horny cells are constantly produced. At any rate, we do not agree with Bland-Sutton, who holds that sebaceous horns are formed in consequence of the protrusion of the contents of a sebaceous cyst through a rupture in the cyst wall, or through

the duct of the follicle, which becomes desiccated on exposure to the air. Gross is of the opinion that horns are directly traceable to chronic inflammation, such as produced by blows, burns, etc. Lall's very interesting case adds weight to our contention. The patient, a middle-aged man, had noticed a small, hard, painless mass upon his left cheek near the angle of the mouth, eight years previous to consulting Lall, the tumor gradually enlarged and the patient consulted a barber who applied medicine, a few days later the skin over the tumor peeled off, and a small, white horn was noticed, the horn became larger and attained a length of almost three inches, the barber cut off the horn but the latter returned rapidly and in a short time was three inches long, Lall was then consulted. He found that the base of the horn involved the entire thickness of the cheek. In our case there was a history of heredity.

Pathology—Crocker and others maintain that horns are essentially overgrown warts and that they always begin in the rete mucosum or the homologue of it lining the glands and follicles. There is always hypertrophy of the papillæ, and upon these the horn is built up, being composed of columns of epidermic horny cells, generally without nuclei. Rokitsansky regards these growths to be in their nature innocent, although Paget believed that there was some relation between horns and epithelial cancer. He referred to a case of soot-cancer in which the borders of the ulcer showed spur-shaped sharp-pointed processes which he believed to be cancerous papillæ. Duiken observed a patient who possessed a horn almost five inches in diameter at the base, and about four inches in length, in which the tissues at the base of the horn became ulcerated, and carcinoma developed. The daughter of Durken's patient possessed a cutaneous horn in a similar location and with the same results. Gould refers to a patient who presented a horn growing upon an epitheliomatous penis, while Pancoast observed a papillary epithelial cancer which developed at the base of horns on the face of a sea captain.

It seems quite probable that the constant irritation naturally resulting from the presence of a cutaneous horn of the scalp, etc, prepares the tissues at the base of the horn for carcinomatous invasion

CASE—Mrs K——, aged 62, married, was admitted to the surgical service of the Evangelical Deaconess Hospital and gave the following history

Family History—Parents died of causes unknown to patient No history of tuberculous or malignant disease in family Mother of patient had sebaceous cysts of scalp One sister had sebaceous cysts of scalp Two daughters and one son of patient had similar growths Patient is the mother of four apparently healthy children

Previous History—Always enjoyed good health Twenty years ago she noticed several “lumps” in her scalp but since they caused her no discomfort and no inconvenience she gave them but passing thought Seven years ago a small warty growth appeared upon the nose She consulted a dermatologist, who removed it by means of an electric needle The dermatologist suspected the growth to be a cutaneous cancer One year after the removal of the growth, the grand-daughter accidentally scratched the area formerly occupied by the latter, thereby causing the parts to bleed Since that time the patient has been troubled with a condition quite similar to that previous to the operation Six years ago the patient fell downstairs striking and rupturing one of the sebaceous cysts, the latter discharged a corn-meal-like substance Five years thereafter she noticed the presence of a hard, horny-like growth in two of the cysts The growth in the ruptured cyst was the larger of the two During the following few weeks she observed an offensive discharge from the base of one of the horny growths The horns have been constantly increasing in size

Present Trouble—Patient comes to hospital to have growths removed, since they cause her annoyance and discomfort They also cause her mental discomfort

Physical Examination—Medium-sized female, fairly well nourished, color good, pupils equal and react normally A scaly growth, evidently a cutaneous cancer, is present upon the right



Cornu cutaneum in human scalp



Cornu cutaneum in hum in scalp

side of nose, upon the left parietal area of the scalp, just below the sagittal suture and near the coronal suture, are two horns, the larger of which is anterior, both horns are somewhat curved and have a peculiar appearance. The skin about the base of the horns has the general appearance of that observed at the base of horns in the lower animals. Three irregular and separate masses, evidently sebaceous cysts, are noted in other parts of the scalp. The general findings are of no interest. Palpation reveals the fact that the horns are superficial to the aponeurosis, movement of the growths cause the patient pain. The three masses described above are sebaceous cysts. The growth on the patient's nose is evidently superficial cancer. Further examination reveals nothing worthy of special mention.

Treatment—The treatment of horns is simple excision. It is needless to say that complete excision of the base of the growth prevents recurrence. In our patient, the two horns were completely excised under local anæsthesia. One of the sebaceous cysts was also removed. The patient refused to permit removal of remaining cysts. Dr Fisch examined the contents of the cyst removed. The rarity and uniqueness of the case in general have caused us to present this report.

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A SELF-RETAINING TROCAR AND CANULA FOR THE ASEPTIC EVACUATION OF DISTENDED VISCERA ¹

BY HOWARD LILIENTHAL, M D,

OF NEW YORK

Attending Surgeon to Mount Sinai Hospital

FOR years I have been impressed by the fact that to the operation for the relief of intestinal obstruction enterostomy adds the grave danger of peritonitis from fecal soiling. Yet enterostomy may be absolutely necessary in order to avoid the perilous handling of heavily loaded intestine, sometimes with dragging upon the mesentery to the point of rupture. No matter how carefully the enterostomy is done, even when the coils of intestine can be drawn out of the wound and incised at a dependent part or when a trusted assistant supports the puncturing trocar and canula, or when it is possible to stitch a tube into the lumen of the viscus, every surgeon knows that here even an approximation to asepsis is impossible. In these cases, too, the peritoneum is in a congested and receptive state, so that infection is hard to avoid.

This matter was recently once more brought to my notice when a death occurred soon after an operation for acute obstruction. Much time had been lost because of my efforts to make the multiple enterostomy as aseptic as possible. Greater speed would have afforded better chances of success.

With the idea of preventing infection and saving time, I devised the trocar and canula here to be described. George Tiemann & Co. have manufactured the instrument after my drawings.

Fig 1 shows the instrument closed and ready for insertion

¹ Instrument present at the meeting of the Surgical Section, of the New York Academy of Medicine, April 6, 1906

into the bowel The size of the canula is 32 French, but it can be manufactured of as small a size as 28 French The trocar (A) is of special construction, flat and double edged, so that it may be inserted with a gentle motion and without the sudden thrust required by the more usual triangular point The handle of the trocar is at A' The part of the canula

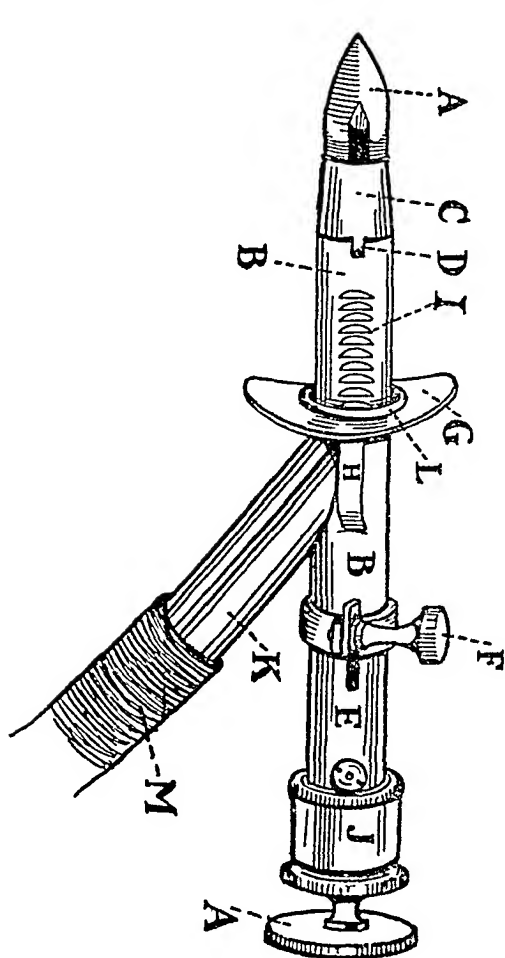


FIG 1

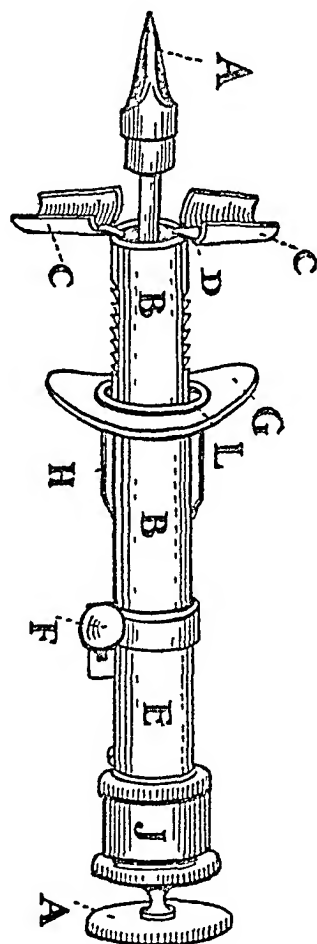


FIG 2

marked C is split longitudinally into two parts which swing out on hinges (D) until they make right angles with the long axis of the instrument (See Fig 2) This swinging out is accomplished with the aid of a simple mechanism by pressing the sleeve E toward the point of the trocar, which can only be done after loosening the set-screw F This screw is then tight-

ened holding the wings in position The shield (G) is next pushed down toward the point of the trocar until it can go no

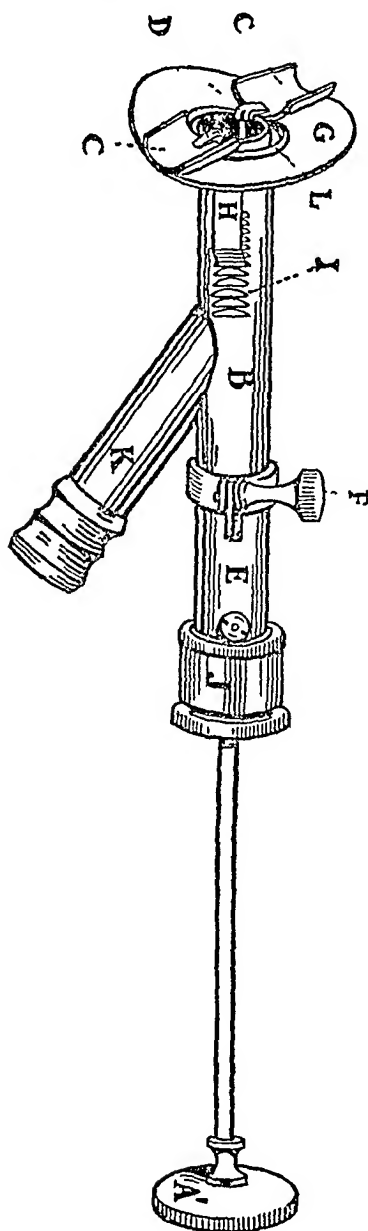


FIG 3

farther, being stopped by the wings (C) The intestinal wall is held firmly between the wings (C) and the elevated ring (L)

of the shield (G) The shield cannot slip back, being held by the springs (H) which catch in the notches (I) The fluid from the intestine at once begins to flow out through K, a branch of the canula, to which a rubber tube (M) has been attached to carry the septic matter to a receptacle remote from the operative field The trocar is drawn back into the canula beyond the branch (K), thus permitting a perfectly free flow The well-known principle of passing the shaft of the trocar through a washer (in the chamber J) has been employed here in order to prevent leakage A little sterile vaseline spread over the trocar and the first portion of the canula facilitates introduction When the wings have once been spread and set and the shield has been pushed down,—the work of but a few seconds,—the instrument is firmly in place and the opening in the bowel is *flush with the wall of the viscus*, a considerable advantage when the intestine begins to collapse It is best to place a preliminary Lembert purse-string suture around the place selected for the puncture, the suture to be tightened as the canula, its wings once more closed, is withdrawn The trocar should not be pushed home when the wings are closed for withdrawal

Two thorough and satisfactory tests with this instrument were made by me, using a piece of dead intestine, tensely distended with water There was no leakage It was also employed three times in operations on the living human subject The first patient was dying of septic peritonitis and an enterostomy was made for drainage, without a preliminary purse-string The instrument was left in for some hours No leakage

The second patient had an enormously distended and greatly thickened gall-bladder The trocar and canula acted perfectly, evacuating in a few moments about twelve ounces of pus previous to cholecystectomy The third patient was a man with acute symptoms following chronic obstruction of the transverse colon by a carcinoma There was enormous distention of small intestine and the first portion of the colon

Evacuation of a gallon of fecal contents through two punctures was aseptically performed. Absolutely no leakage.

Finer points of technique will suggest themselves to the surgeon on using the instrument. For example, in small intestine it may be advisable to insert the trocar at an angle oblique to the long axis of the gut so as to avoid possible injury to the opposite wall. In cases of empyema of the gall-bladder when calculi are present it is conceivable that they may get into the canula wedging the wings apart. If these stones cannot be removed by washing them back into the viscus with a syringe at the rubber tube the instrument may be withdrawn by cutting the wall of the now empty gall-bladder. If it is desirable to wash and partly sterilize the cavity of the gall-bladder before extirpation or other operation, it may be done by lavage with antiseptics.

The writer presents this instrument to the profession with faith in its usefulness and the hope that it may often prove of service in times of great surgical need.

[April 27, 1906. The instrument has been used a number of times since this article was written and has proven itself truly aseptic. For the sake of brevity the name Visceral Evacuator is suggested.]

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 22, 1905

The President, DR GEORGE WOOLSEY, in the Chair

SUPPURATIVE NEPHRITIS RESECTION OF BOTH POLES OF THE KIDNEY

DR CHARLES L GIBSON presented an Italian woman, 28 years old, who entered St Luke's Hospital on September 17, 1905. She had never been pregnant, nor did she give a history of any menstrual disorder. For the past three years she had suffered occasional attacks of obscure abdominal pain. Nineteen days ago she had a sudden severe chill, with violent pain in the left side of the abdomen, radiating forward from the loin, with nausea and vomiting. A few hours later she was admitted to the Mt Sinai Hospital with a temperature of 102.6, pulse, 104, and shortly afterward she had a second chill and a rise of temperature to 104. The leucocyte count on the following day was 9,400. Micturition was frequent and painful, and often the urine was blood-tinged and full of pus. She remained in the hospital thirteen days, undergoing a curettage and a fruitless exploratory incision of Douglas's cul-de-sac. During the past week she had passed almost pure blood, and had had frequent attacks of pain in the left lumbar and hypochondriac regions.

Physical examination showed a strong, well built woman. There were no objective signs excepting resistance and tenderness in the left lumbar region. Her temperature, at the time of her admission to St Luke's Hospital, was 103, pulse, 112. The urine

was acid, specific gravity, 1018, it contained two per cent of albumin and a small amount of pus. A differential count of the leucocytes showed sixty-eight per cent of polynuclear cells, and subsequently only fifty-eight per cent.

The patient was kept under observation for three weeks before operation. She presented the picture of an acute pyæmia, with wide fluctuations of temperature, reaching as high as 106° F, together with irregular chills and marked constitutional depression. A tentative diagnosis of a calculous pyelitis was made.

Operation, October 9, 1905. A ventral incision disclosed a kidney slightly enlarged and congested, but otherwise presenting a normal surface appearance. Exploratory punctures of the kidney were negative. An exploratory incision through the convex border opened a normal pelvis, and exposed only healthy cut kidney tissue. Finally, on decapsulation, there was found at either extremity an aggregation of small miliary abscesses, in some cases confluent. These were treated by shaving off successive thin slices of the kidney until sound areas were reached.

The incision into the kidney was closed with catgut sutures. Packing was carried down to the site of the resected area.

Following the operation, there was some temporary shock, and for four days there was a temperature curve that decreased by lysis from 104.5 to 99. Then there was a remission of symptoms and temperature, followed by another week of fever, but during the patient's last three weeks in the hospital the temperature never reached 100, and was practically normal for two weeks. The wound healed well, without suppuration, and the patient rapidly regained flesh and strength, with the disappearance of all her former symptoms.

On November 18, when her urine was last examined, it had a specific gravity of 1020 and contained neither albumin nor pus.

The sections of kidney tissue removed were submitted to the pathologist, who reported that they showed a suppurative nephritis.

DR GEORGE WOOLSEY mentioned a somewhat similar case that had come under his observation last summer. The patient was a man, who, upon his admission to the hospital, had a high temperature, and examination showed a tender mass, which could be readily palpated, and corresponded to the lower pole of the

right kidney Upon exposing that kidney, the lower third of the organ was found to be much enlarged and studded with numerous small abscesses or necrotic areas The lower third of the kidney was resected and the organ sewed up The pathologist reported that the case was one of suppurative nephritis, staphylococcus being found The man made a good recovery, but still had a small sinus when last seen

Dr Woolsey said that Dr Brewer had reported a number of cases of suppurative nephritis in one of which death had occurred after a conservative operation, and where Dr Brewer thought a more radical operation would probably have given a better result

ANEURYSM OF THE SECOND AND THIRD PORTIONS OF THE RIGHT SUBCLAVIAN ARTERY, PROXIMAL AND DISTAL LIGATION

DR JOSEPH A BLAKE presented a man, forty-three years of age, a native of Vermont, who was admitted to the Roosevelt Hospital on May 10th, 1905, with an aneurysm of the second and third portions of the right subclavian, and the first portion of the axillary arteries

The causation was obscure He had never had syphilis His occupation, a worker in a creamery, necessitated the throwing of heavy cans of milk upon a wagon, and he attributed his trouble to this work

The symptoms had been chiefly pain from pressure on the brachial plexus, and had been noticed for eight months The pulsating tumor was first noticed three months before admission

Examination revealed a fairly well nourished muscular man, with a rather poor color The heart was slightly enlarged and there was a blowing systolic murmur at the apex The second aortic sound was sharp and ringing There was no difference in the radial pulse The arteries were tortuous and somewhat thickened There was a visibly pulsating tumor just above the inner third of the right clavicle, and in the apex of the axilla The tumor projected about an inch above the contour line of the neck Marked expansile pulsation was felt in both locations The tumor above the clavicle was the size of a large hen's egg, while the axillary one was the size of a pigeon's A distinct

systolic bruit was heard above the clavicle and in the axilla. There was no evidence of interference with the recurrent laryngeal nerve. The carotid also appeared to pulsate more fully than normal.

Operation, May 18, 1905, nitrous oxide-ether anæsthesia. Incision was made down the outer border of the sternomastoid muscle to the clavicle, and then out along the clavicle. The clavicular attachment of the sternomastoid and the omo-hyoid were divided. The sac was exposed with its relations, and was found to involve the artery from the inner border of the scalenus anticus to the axillary. Its greatest transverse diameter was about two and one-half inches.

The first portion of the subclavian was not enlarged, neither was the carotid or innominate. The phrenic, pneumogastric and recurrent laryngeal nerves were recognized and retracted. It was then apparent that a ligature could be passed about the first portion without great difficulty. Accordingly, a large aneurysm needle with No. 4 chromicized gut was passed from without inward under the artery, the gut being doubled about the vessel. The double ends were tied in a single square knot, and again separately. The ligature was drawn tight enough to stop the pulsation but probably did not crush the intima. The muscles were then sutured and the wound closed without drainage. Union occurred by first intention.

There was slight pulsation in the sac the next day and still more the second day, which continued until the second operation, although the radial pulse on the right side never became as strong as on the left. His pains also returned, but were localized to the distribution of the ulnar nerve.

Second operation, June 14, 1905, about four weeks after first operation. The first portion of the axillary was ligated through a muscle splitting incision in the pectoralis major. The artery, where ligated, was about $1\frac{1}{4}$ inches in diameter. The aneurysm needle was passed with some difficulty on account of the dilatation of the vessel. A double loop of No. 4 chromicized gut was passed through the single loop, which was then withdrawn, thus passing four strands about the vessel. These were ligated separately, being drawn tight enough to completely obliterate the vessel.

The ligature was placed high, about the aneurysm itself, in order to avoid interference with the branches of the axillary artery. This precaution was well taken, since the circulation in the extremity has been none too good since the operation. The wound healed by first intention. The sac became firm and gradually contracted. There has been no return of pulsation in the sac or radial artery.

The patient is now, four months after the last operation, perfectly well. The circulation, however, in the right arm is poor and the finger nails show disturbances of nutrition.

According to Konig, the right subclavian has been ligated twenty times, with one recovery, the deaths being chiefly due to secondary hemorrhage. According to Sheen, the innominate artery has been ligated thirty-six times, with seven recoveries. Thirty-four of these cases were for aneurysm of the subclavian. In such cases, ligation of the common carotid is also necessary.

Considering the high mortality of ligation of the common carotid, it would seem that, when feasible, as in the present case the first portion of the subclavian should be ligated, followed if necessary by ligation of the upper part of the axillary.

If the ligature does not divide the intima, there is little danger of secondary hemorrhage, there is also little tendency to clot formation, and consequent plugging of the carotid.

DR HOWARD LILIENTHAL said that last spring he showed a very similar case, in which he had ligated the first portion of the right subclavian and right common carotid for a sacculated aneurysm of the third portion of the subclavian.

In connection with that case, Dr Lilienthal said, he had reviewed the literature on the subject, and he had been surprised to learn how frequently the subclavian had been ligated in its first portion. The subclavian and innominate, either together or separately, had been ligated about a hundred times. The subclavian and carotid, together, had been ligated at least ten times, probably oftener. The mortality following ligation of the subclavian had markedly diminished since 1890, having fallen, in the one hundred cases he had collected, from seventy-five per cent to sixteen per cent. The probabilities were that the older operation did not succeed on account of the ligation having been done in the old-fashioned way, cutting through the inner coats of the artery, whereas the safer Ballance-Edmunds knot was now used.

In any future case of this kind that might come under his care, Dr Lilienthal said, he would be inclined to try the Matas operation, which he regarded as perfectly feasible in dealing with a sacculated aneurysm in this region

DR CHARLES H PECK mentioned a case recently seen at Roosevelt Hospital in which the aneurysm involved the first part of the subclavian and probably extended downward into the innominate Dr Brewer ligated the common carotid and three weeks later Dr Peck ligated the third portion of the subclavian A Ballance-Edmunds knot was made, and the suture material was heavy silk The patient made a good recovery from the operations, but at the time he left the hospital, while the aneurysm had shrunk somewhat, it was not cured The patient had since been lost track of

GERSUNY OPERATION FOR INCONTINENCE FOLLOWING PROSTATECTOMY

DR HOWARD LILIENTHAL presented a man, fifty-nine years old, who was operated on two years ago by another surgeon at the Mt Sinai Hospital for the relief of prostatic hypertrophy The suprapubic operation was done, and the prostate removed, and Dr Lilienthal had been assured that no part of the urethra was removed at that time The wound healed without any trouble, but subsequent to the operation the man found himself unable to urinate This necessitated a perineal section, when it was found that the deep urethra seemed to be obliterated The section went straight through what seemed to be scar tissue into the bladder, and this passage was subsequently kept open by sounds The patient finally recovered with complete incontinence, for which he had to wear a urinal

Six weeks ago, when Dr Lilienthal operated on the patient to relieve the incontinence, he found the perineal urethra apparently perfectly normal It was dissected out without the slightest difficulty, and cut across about an inch in front of the anterior layer of the triangular ligament it was then twisted about 300 degrees, anchored to the triangular ligament, and the cut ends of the urethra united by suture

The immediate result of the operation was absolutely perfect The patient, who had always had a small bladder, was able to

hold four ounces of urine for several hours without any difficulty, and only got up twice during the night to urinate. Furthermore, he had perfect control over the act of micturition, and could begin and stop at will. Four days ago, however, dribbling of urine was again noticed, and the speaker said he was inclined to attribute it either to atrophy of the scar, or to the fact that the urethra was becoming untwisted.

Dr Lilienthal said that Dr Charles A. Elsberg, who witnessed the operation, had suggested at the time, but after the cutting of the urethra, that it might have been better not to cut the urethra but to twist it as a whole, to make a double sphincter. In any future operation of this kind, the speaker said, he would be inclined to act upon that suggestion, not opening the urethra at all, but simply dissecting it out, twisting it and then anchoring it.

The perfect control that this man had over his bladder immediately after operation tended to confirm the theory of those physiologists who held that the compressor urethrae muscle controlled the urine at will, and only gave way during the act of micturition, but that the deep sphincter gave way before micturition. In this case, the operative work was done in front of the triangular ligament, and yet the function of micturition was perfectly restored for a time.

SECONDARY ABSCESS FOLLOWING APPENDECTOMY FOR GANGRENOUS APPENDICITIS

DR LUCIUS W. HOTCHKISS presented a man, twenty-three years old, who had been operated on by Dr Hotchkiss at Roosevelt Hospital for gangrenous appendicitis on July 23, 1905. The operation was done at the end of the second day of the disease. A gangrenous appendix was removed, a large abscess evacuated, the pelvis washed out through a small McBurney incision, and a cigarette drain inserted. Although the patient made a good recovery from the operation, his convalescence was very stormy, and was characterized by vomiting during the first three days, and by abdominal distention and colicky pains, which necessitated the steady use of the rectal tube and various enemata. There was a profuse and, at first, a foul-smelling discharge from the wound, which later became simply purulent, and then ceased. The abdo-

minal pain and the distention continued, and were only partially relieved by enemata. The temperature ranged between 99 and 101 F, and never quite fell to normal. At the end of the third week there was an attack of vomiting, with marked distention. No mass could be felt at any time until about the end of the third week, when the patient noticed a swelling on the right side of the scrotum, which was the seat of a reducible inguinal hernia. This swelling increased and became painful, and showed evidences of an abscess in the hernial sac. This, in connection with his previous condition, was thought to be part of a peritoneal pus collection higher up, and preparations were made for an immediate operation.

On August 11, nineteen days after the appendectomy, the second operation was done, and fecal smelling pus was evacuated from the sac of the hernia in the scrotum. After thorough cleansing, the hernial sac, which was thickened and infiltrated, was removed. Its neck was found to be occluded by adherent omentum. The inguinal canal was closed after the Bassini method, and a small drain inserted. A laparotomy through the left rectus was then done, and the peritoneal cavity opened. The omentum and intestines were found adherent anteriorly to the abdominal wall, and had shut off several abscesses of different size in the pelvis. These were evacuated, and the pelvis thoroughly washed out and drained. The cigarette drain was replaced on the sixth day by a rubber tube on account of the profuse discharge, which became fecal on the following day. This fistula continued to discharge profusely for several days, then the discharge gradually diminished and finally ceased in about five weeks, when the patient left the hospital in excellent condition.

Dr. Hotchkiss thought the case somewhat remarkable from the fact that the hernial sac was involved by gravity in the intra-peritoneal suppuration, and also because a radical cure of the hernia was apparently effected under the somewhat adverse conditions that were present. The speaker said he had seen several cases of secondary abscess following appendicitis, and thought the recognition of such a condition most important.

DR. JOSEPH A. BLAKE said that some years ago he saw a woman over sixty-five years old who was suffering from what was supposed to be a strangulated femoral hernia. The protrusion

was tense and tender. The abdomen was found to contain pus, and the case proved to be one of peritonitis, originating from a gonorrhœal salpingitis. The patient made a good recovery after abdominal lavage and removal of the infected tube.

DR WOOLSEY recalled a case operated on by the late Dr Hall at Roosevelt Hospital in 1886, where a supposed strangulated hernia proved to be a tubercular abscess in the hernial sac, extending into the lower abdomen. The removal of the appendix in this case was the first of the kind in the United States.

[L. I. I.]

CARCINOMA OF THE STOMACH

DR CHARLES N DOWD presented a young woman, of twenty-four, who stated that her digestion had never been good, starchy food being particularly disturbing. About two years ago she began to have pain in the right hypochondrium, and to vomit frequently. The vomitus was blood-stained a few times, but there was never marked hæmatemesis. The pain was often so severe that she caused herself to vomit to relieve it.

In the latter part of the spring of 1905 her discomfort was so great that she was unable to attend to her ordinary duties. On examination, a movable mass, about two by four inches in size, and very tender on pressure, could be felt just below the margin of the ribs at the right of the epigastrium, and could be pushed upward under the border of the ribs.

Operation, June 7, 1905. The mass was found to be an adeno-carcinoma of the greater curvature of the stomach, involving both the anterior and posterior walls, and situated just to the left of the pylorus. A partial gastrectomy was done by the method described by Mayo. The stomach was divided across just to the right of the median line, and the duodenum just at the border of the pylorus. The edges were inverted with chromic gut sutures, and a posterior gastrojejunostomy was done with the aid of a Murphy button, the upper part of the jejunum being used.

The patient made a rapid recovery, the button was passed on the twentieth day and she left the hospital on the thirty-third day. In less than two weeks after her discharge from the hospital, the patient, who was a trained nurse by profession, was able to take charge of a severe case of illness. She has gained almost forty pounds in weight.

The interesting features of this case, Dr Dowd said, were the age of the patient (twenty-four years), the presence of a movable mass which could easily be felt and its location in the greater curvature of the stomach instead of at the pylorus. The stomach was found to be firmly adherent to the pancreas, which, according to Mickulicz, renders these cases particularly unfavorable, his mortality rate being about seventy per cent when this condition was present. Dr Dowd said he had found the operation described by Mayo comparatively easy, and there was absolutely no tension following the anastomosis, and in that respect it was an improvement on the Kocher operation.

DR HOTCHKISS said he shortly expected to report in detail a case of carcinoma of the stomach in a young man, twenty-four years old, the same age as the patient shown by Dr Dowd. This young man had been in the enjoyment of reasonably good health, when he had a sudden attack of gastric pain, with vomiting. He then began to lose flesh, and upon examination, a large, movable tumor in the upper part of the abdomen was discovered. Upon operation, the tumor was found to involve the posterior wall of the stomach, the lesser curvature and the pylorus to some extent. A partial gastrectomy was done and the patient made a good recovery.

DR JOSEPH A. BLAKE said that in two cases of carcinoma of the stomach that had recently come under his observation, an analysis of the stomach contents showed, respectively, one hundred and twenty per cent and seventy per cent of total acidity. The amount of free hydrochloric acid was also excessive, showing the unreliability of this symptom in the diagnosis. In neither of these cases was there palpable tumor. In both there were obstructive symptoms, and both were regarded as cases of chronic ulcer of the stomach. At operation the growths were so extensive that pylorotomy was out of question.

DR ALEXANDER B. JOHNSON said that some years ago he operated on a boy, not over fifteen years of age, with a massive carcinoma of the stomach which involved almost one-half the great curvature. The tumor was found inoperable after the abdomen was opened.

DR WOOLSEY said that the statement made by Mickulicz, to which Dr Dowd had referred, that strong adhesions between

the stomach and pancreas greatly increased the operative mortality in these cases had led him on one or two occasions to abandon the idea of resecting the stomach. Of course, where the adhesions did not cover a large area or were not very firm, it was perfectly justifiable to go ahead and take the risk.

CARDIOSPASM WITH REPORT OF AN OPERATIVE CASE

DR JOHN F ERDMANN read a paper with the above title (for which see page 224)

DR LILIENTHAL said that these cases must be extremely rare, and probably, if they were common enough, an instrument could be devised which would accomplish exactly what was necessary, and without the dangers which Dr Erdmann had mentioned. If the condition could be remedied by a non-operative method, it should certainly be preferred to an operation. A device which might possibly prove serviceable in these cases was the rubber bag that was quite commonly used for the purpose of dilating the cervix uteri. It was covered with a spool-shaped silk covering and if it could once be introduced into the cardia it could be inflated without danger of lacerating the tissues and there would be no possibility of rupturing the rubber.

DR ERDMANN said that in the case reported by Straus, to which he had referred in his paper, the cardiospasm was treated by means of an inflatable rubber bag attached to the distal end of a stomach tube. The ultimate outcome of that method was still in doubt, as the cases in which it had been resorted to were of very recent occurrence.

ŒSOPHAGEAL TUBE FOR USE DURING NARCOSES

DR WILLY MEYER showed an instrument designed by Krausch for the purpose of obviating fecal drowning during operations for intestinal obstruction.

DR ROBERT H F DAWBARN commented favorably upon the ingenuity of the device shown by Dr Meyer. He added, however, that for those who might not wish to buy all new contrivances if they could make others do the same work,—and particularly in discussing material of such comparatively short life as rubber,—the same good purpose of preventing fæces from passing during operation up the œsophagus from the stomach might

be accomplished by the use of Dr Syms' perineal prostatic retractor. Of course, it was a convenience in the device shown by Dr Meyer that it was hollow from end to end, and through it one might finally wash out the stomach. However, on removal of the Syms' retractor, a stomach tube could in a few moments be passed in its place, and do the same work of lavage.

CONGENITAL HYDRONEPHROSIS

DR ERDMANN showed a specimen, which was removed from a child three months old. The circumference of the child's abdomen prior to the operation was $21\frac{1}{2}$ inches, and immediately after the operation 13 inches, and the weight of the child fell from fourteen and a half pounds to nine and three-quarter pounds. The only history obtainable was that the child was born with considerable difficulty on account of the presence of an immensely enlarged abdomen. The operation was done three weeks ago and the patient made an uneventful recovery.

Stated Meeting, February 28, 1906

The President, DR GEORGE WOOLSEY, in the Chair

PERFORATED GASTRIC ULCER, GENERALIZED PERITONITIS

DR CHARLES H. PECK presented a woman, 23 years of age, who was admitted to Roosevelt Hospital, service of Dr R. F. Weir, late in the evening of December 17, 1905, with the following history. She had been troubled with indigestion for a long time, and about two years ago had vomited some blood. There had been no especial exacerbation of symptoms of indigestion up to 6 o'clock the afternoon before admission, when she was suddenly seized with violent epigastric pain, vomiting and collapse. There was no blood in the vomitus. The pain continued, and distention of the abdomen increased steadily up to the time of admission.

On admission, the abdomen was found greatly distended, tenderness and rigidity were general, but greatest in the upper

half of abdomen On percussion there was complete absence of liver dulness, tympanitic note all over front of abdomen with shifting dulness in the flanks, no fluid wave detected, facies anxious, respiration rapid and shallow, pulse, 138, small and thready No leucocyte count was made A diagnosis of perforated gastric ulcer was made, and the patient was immediately prepared for operation

Operation at 11 P M, 29 hours after the onset of symptoms of perforation Ether anæsthesia

A median incision made above the umbilicus, on opening the peritoneum, there was a gush of gas and turbid fluid Thick flakes of recent lymph covered the anterior aspect of the stomach, and the adjacent surfaces of the liver and surrounding peritoneum Some delay was caused by searching for the perforation in the region of the pylorus before it was finally located about midway between the greater and lesser curvatures on the anterior wall, not far from the centre of the anterior aspect The perforation was large enough to admit the little finger The surrounding stomach-wall, for a radius of nearly an inch, was thickened, infiltrated and friable The perforation was closed with silk mattress-suture, placed with some difficulty, owing to the friability of the surrounding stomach-wall, and a few silk Lembert stitches effected an imperfect inversion of the area The peritoneal cavity was then rapidly flushed with salt solution through the large Blake tube Purulent fluid, flakes of fibrin, and particles of food were washed from every part of the peritoneal cavity (excepting the lesser sac), including the sub-diaphragmatic space Large quantities were removed from the pelvis and both flanks, the abdominal cavity was unusually long and capacious The gall-bladder and liver were normal

Two large cigarette drains were placed down to the site of the perforation, between the anterior surface of the stomach and the under surface of the liver, and excepting at their point of exit, the abdominal wall was closed by layers with catgut, chromic gut, silkworm and silk Time of operation, 34 minutes, patient's condition very poor

The patient rallied well under stimulation, the bowels were moved by an ox-gall enema at the end of 48 hours, and the symptoms of peritonitis gradually subsided There was little

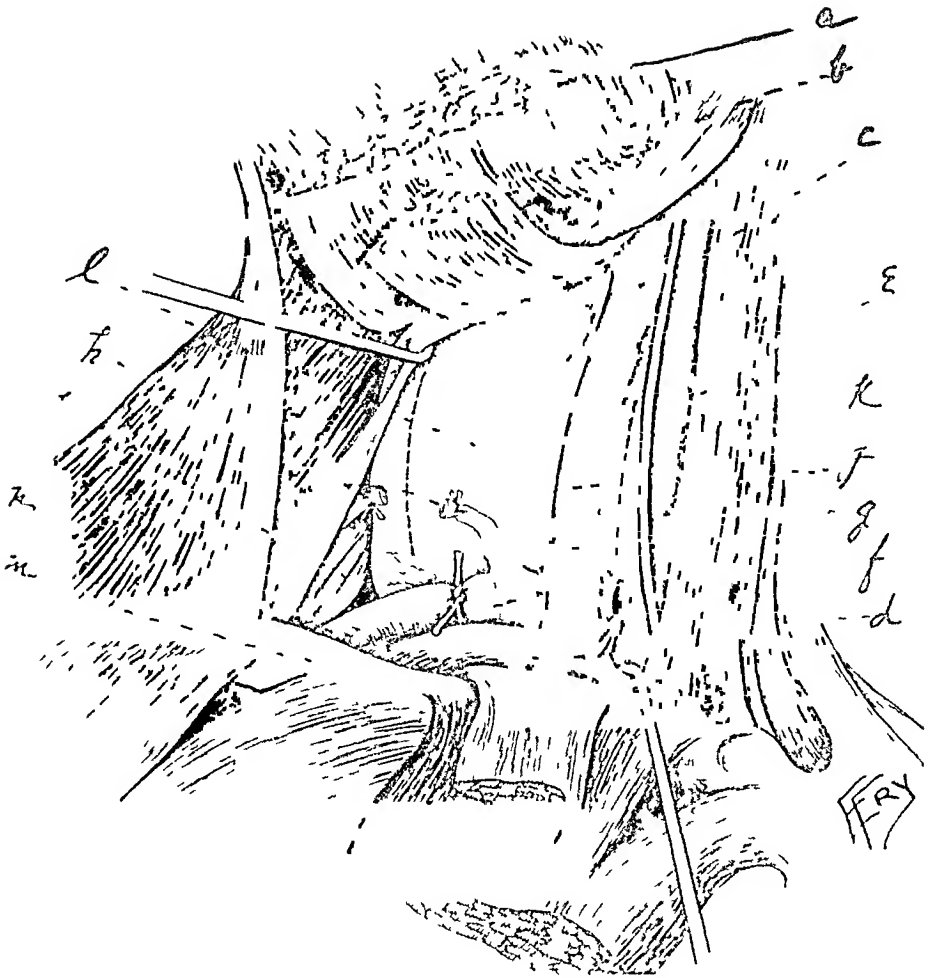
or no vomiting after the operation, and the temperature subsided gradually, but the pulse remained persistently high (115 to 130) for more than a week. The drains were first removed on the sixth day, and replaced by smaller ones. There was a rather profuse discharge from the drainage-tract for about two weeks, but there was never any escape of food or gas. There was some late infection in the muscular planes, which subsided without incident. Milk feeding was commenced at the end of forty-eight hours, and soft solids in about ten days. Convalescence was somewhat slow but progressed favorably, and at the time of the patient's discharge from the hospital, on January 24, 1906, while still weak, her condition was very satisfactory. The wound was entirely healed, excepting a shallow sinus at the point of drainage. A small abscess developed in the abdominal wall about three weeks later, but healed without incident.

TRAUMATIC ANEURISM OF THYROID AXIS

DR CHARLES H. PECK presented a boy, 14 years of age, who was admitted to Roosevelt Hospital, service of Dr. R. F. Weir, on January 12, 1906, with the following history. On New Year's Eve, 12 days prior to admission, he was stabbed in the neck with a tin horn. He was brought to the hospital at once in the ambulance, suffering from shock and hæmorrhage.

There was a small lacerated wound ($\frac{1}{4}$ in long) about $1\frac{1}{2}$ inches above the centre of the right clavicle, which bled profusely, and there was an extensive ecchymosis in the surrounding region. The wound was dressed, and he was kept in the ward for two days for observation. The hæmorrhage was easily checked by pad pressure and bandaging. Condition rapidly improved, and he left the hospital with the wound healing cleanly, rather widespread ecchymosis, but no paralysis, nor evidence of nerve injury or pressure, symptoms which were carefully looked for as the point of injury was over the brachial plexus. He returned to the accident ward for dressing every day or two, the wound healed by first intention, and the ecchymosis subsided, but he began to complain of pain in the shoulder and upper arm. On January 12, the day of admission, he returned, complaining that the pains were increasing and that the arm was weak.

On examination, a pulsating tumor was found beneath the



TRAUMATIC ANEURYSM OF THYROID AXIS

a, Sternomastoid, divided and reflected b, Scalenus anticus, divided and reflected c, Internal jugular vein d, Subclavian vein e, Common carotid artery f, Subclavian artery, showing ligatures on first and third portions g, Thyroid axis, forming stalk of aneurismal sac h, Transversalis colli artery, ligated and divided i, Brachial plexus j, Phrenic nerve k, Vagus l, Aneurismal sac, dotted lines indicate where sac was laid freely open at outer and inner aspects m, Clavicle n, Omohyoid

lower part of sternomastoid, projecting beyond its posterior border, and anteriorly to its anterior margin. The upper limit could be fairly well defined, and was $1\frac{1}{2}$ to 2 inches above the clavicle, the lower limit could not be defined, extending down to the clavicle. Pulsation was expansile and strong. There was marked inequality of the pupils, that of the injured side being contracted, indicating pressure on the sympathetic nerve. There was a partial paralysis of the upper-arm muscles, most marked in the deltoid, caused by pressure on the brachial plexus. He was admitted to the ward for observation. During the following thirteen days, up to the time of operation, the symptoms did not materially change, excepting that the tumor increased slightly in size. The paralysis of the arm also increased slightly, but the pain remained about the same. The inequality of the pupils persisted. There was no inequality in the radial or temporal pulses.

Operation, January 25, 1906, under ether. A V-shaped flap was dissected back, its anterior margin following the lower half of the anterior border of the sternomastoid, and its lower margin the clavicle. The external jugular vein was doubly ligated and divided, the sternomastoid was divided transversely about one inch above the clavicle, and reflected in both directions. The phrenic nerve was exposed on the anterior aspect of scalenus anticus, dissected free from it, and lifted forward with the internal jugular vein. The vein was then separated from the vagus and the carotid, and drawn outward. This exposed the anterior aspect of the inner part of the aneurismal sac, and below it the first portion of the subclavian artery, separate from the sac. A double safety ligature of heavy floss silk was passed around the artery. The third portion of the artery was then exposed external to the scalenus anticus, and a similar safety ligature placed at this point. By careful blunt dissection and retraction of the scalenus anticus, the entire artery was exposed, it was normal in size and appearance. Above it, and in direct contact, lay the aneurismal sac, passing from the artery directly into the sac was the short stem of the thyroid axis. Passing from the sac outward, the transversalis colli artery was seen. It was doubly ligated, and divided. An attempt was then made to pass a small, sharply curved aneurism needle around the thyroid

axis, close to the main vessel,—*æ*, between it and the aneurismal sac, but in spite of great caution, the sac, a false one, was ruptured in the attempt. Hæmorrhage was profuse, the safety ligatures were at once tightened, but only partly controlled the bleeding. The sac was torn into on its outer margin, and a finger thrust in, controlling the return flow from the branches by direct pressure. The safety ligature on the first portion of the subclavian was then tied with the double strand, Ballance-Edmunds knot, the other safety was replaced by a single strand of silk, tied on the second portion of the artery distal to the thyroid axis. The scalenus anticus was then divided transversely, and reflected, exposing the anterior aspect of aneurismal sac thoroughly. Pressure with the finger within the sac was kept up continuously, severe hæmorrhage occurring the moment it was removed. Attempts to secure the bleeding point through the outer opening in the sac failed, and gauze packing also failed to control it. The internal jugular vein was retracted outward, and the sac laid freely open on its inner border, clots were cleared out, and after long effort the principal bleeding point in the upper wall of the sac was secured by a clamp, which was left in place. The remainder of sac was packed with sterile gauze from both outer and inner sides to control the remaining hæmorrhage. The sternomastoid was sutured with chromicized catgut, the skin with silk. No attempt was made to suture the scalenus anticus. An intravenous saline infusion of 1000 cc was given on the table. Time of operation, $2\frac{1}{4}$ hours, condition fair. The aneurismal sac was a false one, posteriorly it lay on the prevertebral muscles, its lower margin extended down to and slightly behind the beginning of the innominate, and the first and second portions of the subclavian, its outer margin lay on the cords of the brachial plexus, the upper margin was beneath the origin of the scalenus anticus, the phrenic nerve and the internal jugular vein crossed the centre of the sac.

The patient reacted well from the shock and hæmorrhage. There was a sharp reaction of temperature to 103.4 in the first twenty-four hours, after which it never rose above 100. The radial pulse was first felt at the right wrist on February 4, the tenth day after operation. On February 5, the eleventh day after operation, the clamp was removed, and the gauze packing

withdrawn from the sac from both inner and outer sides. There was no hæmorrhage. A small rubber tissue drain was placed in the anterior opening, and all stitches were removed. The wound healed without infection, and is now completely closed, excepting for a small granulating defect at the anterior drainage point and one at the point of flap, where a small area of skin necrosed. The patient was allowed out of bed on the twentieth day after the operation. At the time of his discharge from the hospital, the paralysis of the arm had begun to improve slightly, but the pupils were still unequal.

At the present time, February 28, 1906, the paralysis has entirely disappeared from the arm, but there is still some inequality of the pupils. The pain in the arm disappeared shortly after the operation.

TYPHOID PERFORATION

DR JOSEPH A. BLAKE presented a man 38 years old, who was admitted to the medical service of the Roosevelt Hospital on November 1, 1905, in the estimated seventh day of a relapse of typhoid fever. On admission, his temperature was 103.6° , pulse, 90, respiration, 24, leucocytes, 14,600, Widal, negative. From the seventh to the thirteenth day, temperature varied from 102° to 104° , pulse 96 to 120. On the tenth day, the leucocytes were 8,000, the differential, 77 per cent of polymorphonuclears. On November 8, the fourteenth day of the relapse, his temperature dropped at noon from 103.4° to 99° , the pulse from 100 to 88, the respirations to 20. This was followed by a severe chill at 5 P.M., with rise of temperature to 104° , pulse 104, respirations 24. He complained of some pain, referred to the umbilicus. There was slight distention, a good deal of rigidity and some general tenderness. At midnight he was asleep and comfortable, at 3 A.M. he complained of some abdominal pain on drinking a glass of water, at 6 A.M. there was some distention, marked board-like rigidity, general tenderness, and absolute loss of liver dulness. Temperature 98° , pulse 100, respirations 24, leucocytes 15,300, differential, 79.6 per cent polymorphonuclears.

When Dr. Blake saw the patient that morning, he advised immediate operation, which was done under nitrous-oxide-ether anæsthesia. The incision was made in the median line, just above

the pubes, on account of the maximum tenderness being at that point, and of the fact that by the rectum an indefinite fulness was felt in the pelvis. A diffuse sero-purulent peritonitis extending to the transverse colon was found, and the belly contained free gas. The pelvis contained coils matted together by a fibrinous and purulent exudate, together with considerable fecal matter. One of the coils of the ileum, lying at the bottom of the pelvis, exhibited a single perforation about 4 mm in diameter. This was closed by a silk purse-string and reinforced by a continuous silk suture. No other perforations or thinned portions needing suture were found. The mesenteric glands were considerably enlarged. The abdominal cavity was thoroughly irrigated with the double current irrigator, and the wound closed with a cigarette drain reaching to the bottom of the pelvis. Time of operation, 23 minutes.

In this patient, the perforation had evidently occurred at 12 o'clock noon on the day before, that is, just 24 hours before operation, and had caused a local pelvic peritonitis. Six hours before operation it had burst its confines and spread, giving rise to the characteristic signs of peritonitis. The location of the perforation in the pelvis was responsible for the slight symptoms at first, the marked improvement in the earlier symptoms having been undoubtedly due to the slow absorption that occurs in pelvic inflammations. The after-course was characterized by a fair recovery at first, but with continued suppuration from the wound, with no tendency to heal. On the fifty-first day after operation the sinus was explored, under ether, and a quantity of dirty granulations from a deep pocket in the pelvis were curetted out. After this procedure, his convalescence was steady, and he was discharged on the seventy-second day, with a small granulation at the site of drainage.

CEREBRAL CONTUSION, OPERATION

DR JOHN A. HARTWELL presented a boy, ten years old, who was admitted to the Lincoln Hospital February 4, at 2 P. M., with the history of having fallen a distance of 20 or 30 feet, and landing on his head and shoulders. No one actually saw him fall, so that it was impossible to get accurate data on the above points. He was brought to the hospital in the ambulance in a condition

of considerable shock, and partial coma. He could be aroused with difficulty, surface cold and pale, temperature 99.2, pulse 120 and weak, respiration, 32. There was no paralysis. Pupils were dilated. No localizing symptoms of any sort could be made out. Examination of the head showed an extensive hæmatoma over vertex and left parieto-frontal region. No evidence of fracture could be made out under this hæmatoma. There was no bleeding from the ears, mouth or nose, nor any subconjunctival hæmorrhage. The child was put to bed and the usual remedies for shock, including rectal irrigations and morphine, were given. In the course of an hour the shock had considerably lessened, and the coma was less deep. He continued to recover from the shock, but the coma again deepened, and the irritability, on being aroused, was becoming excessive. No coordinated response could be elicited in any way. He resented very markedly any manipulations, or any effort to make him answer questions. He failed to recognize his father.

All the reflexes were markedly exaggerated, but no paralyses or anæsthesiæ could be made out. His condition was diagnosed as one of severe cerebral concussion, with progressing paralysis of the cerebral vessels, and beginning œdema of the brain. Under ether anæsthesia, two hours and a-half after admission, incisions were made over the hæmatomata, and the skull explored, no evidence of fracture could be found. It was determined to open the skull for the purpose of exploration. Accordingly, the temporal muscle on the left side was exposed along its origin, its fascia turned back by a semilunar incision, and the fibres separated vertically, according to the method advocated by Cushing. A one-inch trephine opening was then made at a point one and a-half inches above, and one inch in front of the external auditory meatus, exposing the dura, this was seen to be dark in color, very tense, and without pulsation. No extra-dural hæmorrhage was found. The skull was rongeué away in all directions, making an opening of about $2\frac{1}{2}$ inches in a longitudinal by 2 inches in a vertical diameter. The same condition of the dura was present in this whole area. A small opening was then made in the dura, and blood-tinged cerebro-spinal blood spurted out to the distance of about 3 or 4 inches, thus showing the pressure under which it existed. The dura was then cut away

over the whole surface from which the bone had been removed, exposing the brain beneath, the brain did not pulsate, the small superficial blood-vessels were dilated to three or four times their natural size, and the blood in them was of a dark, venous color. There was no actual trauma of either the vessels or the brain-tissue itself apparent. In the course of three or four minutes the pulsation in the brain gradually returned, the blood-vessels became much less prominent, and the blood in them became of an arterial color. Coincident with these changes, the condition of the patient's pulse and respiration was closely watched, but it could not be determined that any change took place, the pulse rate remaining from 110 to 120. The temporal muscle, which had been retracted antero-posteriorly during the manipulations in the skull and brain, was now allowed to fall together again, and was tacked with three or four catgut sutures, the temporal fascia was carefully sutured along the curved section with catgut, a small drain being left down to the brain-tissue. A copious dry dressing was applied to the wound. The child recovered from his anæsthesia without incident, and in the course of 3 or 4 hours was entirely conscious with practically no symptoms of cerebral irritation. He gave the details of his injury, and told his name and address. His convalescence was uneventful, the wound healed *per primam*, and the pulsation beneath the temporal covering of the brain has been present ever since. There is no tendency for any increase in the size of the cerebral protrusion, but on the other hand, a decrease. Immediately after the operation, and during the following days, it was as much as one-half to three-quarters of an inch above the skull level. It has gradually lessened, until now its maximum is only one-quarter of an inch, and palpation shows it to be less tense than it was two weeks ago. It would have been better to have made an osteoplastic flap, but no instrument for this was at hand, excepting the gouge and mallet, which, under the existing conditions, would have been exceedingly dangerous from the continued jarring necessitated. An attempt to leave the dura *in situ* and re-suture it failed because of the great tension, and the subsequent gradual subsidence of this tension shows that a replacement of this dense membrane would have continued to an excessive intracranial compression, and defeated the very object of the operation. The uncovered

brain is a "silent area," and it may be hoped that the pericranium will develop enough thickness and firmness to protect it

The conditions which determined operation on this boy were rapidly increasing coma and cerebral excitability, with the strong belief by all those observing him that he was developing the very condition found,—namely, a vasomotor, paralytic cerebral œdema, which would inevitably prove fatal if not relieved. The absence of localizing symptoms left no other course than to produce a de-compression of the brain, and thus combat the loss of tone in the cerebral vessels

Subsequent Note, March 5, 1906—The protrusion of the brain has entirely subsided, and given place to a depression one-half inch below the scalp, that is, to its normal level

DR GEORGE WOOLSEY said he had done a somewhat similar operation in a case of tumor of the brain for the same purpose as proposed by Dr Cushing, although in his own case he did not split the temporal muscle, as he wanted more room. The operation was comparatively easy, although it simply disclosed an increase in brain pressure. A needle was inserted into the lateral ventricle, and about six drams of fluid withdrawn. The man made a prompt recovery from the operation, and the very severe headache, from which he had previously suffered, disappeared. He was also practically totally blind and deaf, the former symptom was unaffected by the operation, but there was slight improvement in the deafness. The operation was justifiable in cases where the brain lesion could not be localized, and where there were indications for relief from brain pressure

FORWARD DISLOCATION OF THE CARPUS

DR IRVING S HAYNES presented a man, 35 years old, who was admitted to hospital on January 30, 1906. The history he gave was that last September, while working at a wire-machine, his right hand was caught in a loop of wire and severely twisted. After the accident, he was treated for a time at the dispensary

Examination showed a scar one-quarter of an inch wide across the back of the wrist. The lower end of the radius was considerably thickened, but the styloid process seemed to be in its normal relation to that of the ulna. There was a complete forward dislocation of the carpus, without lateral displacement

The movements of the wrist were fair, and those of the fingers were normal, but he complained that the hand tired easily. An X-ray negative showed a forward dislocation of the carpus, and apparently an indistinct line of fracture of the radius about one inch above its lower end, with slight tilting backward of the lower fragment. In other words, it looked like an old Colles' fracture, with dislocation of the carpus in addition.

On January 31, 1906, under ether anæsthesia, reduction was attempted by manipulation, but this proved impossible. The joint was thereupon exposed through lateral incisions, an examination confirmed the above findings, and showed, in addition, that the carpus lay in a shallow depression in front of the radius. The first row of carpal bones were removed singly, and reduction was then easily accomplished. A through-and-through drain of a dozen silkworm-gut strands were inserted, and the wounds sutured. A plaster-of-Paris dressing maintained the hand in an over-corrected position. The drainage was removed on February 2, and the patient was discharged five days later.

An examination on February 28 showed that the position of the carpus was good. There was excellent motion in the wrist and fingers, considering the short time that had elapsed since the operation, and the continued use of the splints. The incisions healed without incident save in one small spot.

HYPERTROPHY (FIBROADENOMA) OF THE BREAST

DR IRVING HAYNES presented a photograph and specimen, removed from a girl of thirteen years, who was admitted to hospital on January 26, 1906.

In April, 1905, it was noticed that both breasts began to enlarge. They were a little painful on pressure, but this symptom soon disappeared. The breasts were almost equal in size, the right one being perhaps slightly larger than the left until last September, when the latter began to enlarge very rapidly. Menstruation, at that time, had been established a year ago, and was regular.

Examination showed that the right breast covered the area from the second to the sixth ribs, and from the anterior axillary line to an inch and a-half from the sternum. It was firm, and



FIG 1 —Fibro adenoma of breast

while considerably larger than usual for a girl of her age, it did not show any evidences of abnormal growth

The left breast was very large, reaching to the ilium when the patient was standing (Fig 1) A record was not made of its length and circumference, but after removal it weighed exactly eight pounds The nipple was flattened, and the region about it excoriated Sensation over the area was diminished The breast was freely movable on the deeper structures, it was not painful, and only inconvenient by reason of its weight and size The axillary glands were not enlarged

On January 30, 1906, under ether anæsthesia, the breast was easily and quickly removed The wound healed by primary union, and the patient left the hospital on February 13 Dr Rogers, pathologist to the hospital, reported that the growth was a fibroadenoma undergoing mucoid degeneration

In addition to the hypertrophy of the breast, the girl had a fibrous growth of the gums of the right side of both the upper and lower jaws, in which the teeth were nearly buried This growth had existed since childhood, it was not painful, it did not bleed, and had been very slow in its development

DR BLAKE said the condition of the girl's gums recalled a case of symmetrical hypertrophy of the gums which came under his observation about three or four years ago On looking up the subject at that time, he found that the condition was a rare one The microscope showed a dense, fibrous hyperplasia of the tissue of the gums, and suggested some defective nerve influence The condition was analogous to what he had observed in hypertrophy of the bones and tissues of one side of the face

THE DIAGNOSIS AND TREATMENT OF TYPHOID PERFORATION

DR GEORGE WOOLSEY read a paper with the above title (for which see page 652)

DR JOSEPH A BLAKE said he thought it was a reproach that more of these patients did not come to operation His own experience with typhoid perforation was limited to eight cases, with four recoveries In regard to the diagnosis and the indications for operation, Dr Blake said he agreed essentially with Dr Woolsey He mentioned one case which he saw in con-

sultation with Dr Peck last fall where there was pain and a trifling amount of rigidity, an operation was advised, but the attending physician decided to wait a little longer and the patient eventually recovered without an operation. In that case there were undoubted signs of peritonitis, probably from deep ulcerations, and an operation would perhaps have been the least dangerous plan of treatment.

Rigidity, Dr Blake said, was not a very reliable symptom in typhoid perforation, although sometimes it was pronounced. Pain was the most important symptom, but the fact should not be lost sight of that the sensorium of these patients was oftentimes clouded. In operating, the speaker said, he had always employed general anæsthesia, and made his incision in the lower part of the rectus. In some of his cases, he had closed the wound without drainage, in these, there had not been much exudate left in the abdomen, and they did as well or better than those in which drainage was employed. He had always irrigated freely with large quantities of saline solution.

DR JOHN A. HARTWELL reported the case of a friend not under his own care where during the third week of typhoid there was hæmorrhage from the bowels, with vomiting, and sudden pain in the right lower quadrant of the abdomen. Rigidity was not marked. Upon opening the abdomen, there were evidences of peritonitis, with considerable exudate, which was just becoming purulent. No perforation was found. Drainage was established and recovery ensued.

In a second case occurring in the service of Dr Adrian V. S. Lambert, at the Lincoln Hospital, the woman gave a history of having been ill for five or six weeks. She had had fever and pain in the abdomen, and was bedridden, but the exact nature of her illness had not been determined. Upon examination, a tumor was made out in the region of the appendix, and she was operated on under the impression that the case was one of appendicitis. Upon opening the abdomen in the usual site for such operations, a large abscess was evacuated, but the appendix itself could not be found. Shortly after this operation, the patient developed a fæcal fistula which failed to heal, and after five or six months the abdomen was again opened through the old scar, and several large perforations were found, one in

the caput coli, and the others in a coil of the ileum at some distance from the ileocæcal junction. The nature of these perforations suggested that they were due to some ulcerative condition. The appendix, apparently perfectly normal, was found lying behind the cæcum, and it had evidently not been the cause of the previous trouble. The case, was reported as possibly one of typhoid fever, with ulcerations through the cæcum, though the indefiniteness of the early history made the diagnosis necessarily uncertain.

DR WOOLSEY, in closing, in discussing the subject of peritonitis without perforation, said it was a well established fact that adhesive peritonitis did occur, and he had seen cases where omental adhesions covered an ulcerated Peyer's patch. In a case shown at a meeting of the Society some years ago by Dr F Tilden Brown, in which recovery had taken place after perforation, the result was partly attributed to the fact that the omentum had become adherent over the ulcerated Peyer's patch, and had acted as a trap-door, so that very little exudate escaped into the peritoneal cavity. In that case, the wound was closed without drainage. Such a condition would also account for the so-called cases of perforation that recovered without operation. This subject had given rise to a good deal of controversy, and while some held that the mortality of typhoid perforation without operation was 95 per cent, others claimed that it was as high as 100 per cent. Osler is reported to have never seen a recovery in such a case. In those cases where recovery occurred, there was probably a certain degree of peritonitis, but without perforation.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY

Stated Meeting, February 2, 1906

The President, DR D A K STEELE, in the Chair

CESOPHAGEAL POLYP REMOVED BY OPERATION

DR W R CUBBINS (by invitation) reported a case of œsophageal polyp removed by operation, and exhibited the specimen. The patient was 45 years of age, married, occupation, roofer. He had been previously healthy, he gave no history of any disease. He was the father of ten children, seven of whom were living. During the administration of an anæsthetic for the reduction of a dislocated shoulder joint the patient vomited, and during this act the tumor was extruded from the mouth, and was grasped and measured, so that it protruded four inches outside the mouth. He wanted to remove the tumor, but the patient's wife objected and insisted on his returning it, and it was swallowed back. After this it was necessary to anæsthetize the patient again for another operation, and several attempts were made to remove the polyp by introducing a forceps down through the œsophagus, but were unsuccessful. Shortly after this the patient began to develop symptoms of obstruction. These were not severe at first but at the end of three months obstruction was so marked that he was unable to take anything except liquids. Solid food was ejected unchanged. The tumor seemed located at the sternal notch. For over half an hour it was impossible to get fluids up or down. Patient could neither vomit nor swallow. At the end of three-quarters of an hour the tumor seemed to pass down, so

that the patient was again able to swallow water or milk and other liquid food. He had become very much emaciated when he appeared the second time. He was now prepared for an operation on the neck, and attempts were made to nauseate him, so that he would throw up the tumor. His stomach was filled with water, he was given some apomorphia, but no fluids would come up. He was, therefore, anæsthetized, but attempts made to draw the tumor from the throat failed. Dr Wm E Schroeder and the speaker then did a lateral œsophagotomy, after having located the œsophagus with stomach-tube, and they found the tumor situated on the anterior portion of the œsophagus, with the pedicle a little to the left of the median line just above the larynx and cricoid cartilages and extending down into the œsophagus for about seven inches. It was ligated and removed, and the wound closed, with packing. The tumor measured sixteen centimetres in length, just above the lower end it was rather cone-shaped, and was five centimetres, in diameter and at the pedicle one centimetre. It weighed 210 grams. The lower end was eroded when they removed it. When it was first extruded, six months before, there was no erosion at the lower end.

In looking up the literature the reporter had found the best article on the subject had been written by Minski, of Dorpat, who had gone back to 1687 and had brought the literature down to 1887. The first case was seen by von Heys, who tried to get rid of the tumor by brushing it, and in so doing excited inflammation which killed the patient. This article was exceedingly interesting from the fact that it was printed in five languages, Latin, French, German, English, and Swedish.

They found three cases reported in which the tumor was removed by the mouth. The tumor had been thrown up and held until it was clipped off, the pedicle ligated, and returned. The other tumors were diagnosed at autopsy. The patients had symptoms of obstruction during life. The tumors were located at different places in the œsophagus, from the upper portion of the larynx down to the middle portion. Some extended down as far as the pylorus (?).

These tumors had been described as steatomata, but the more recent ones as fibromata, with large amounts of fat. The microscopic slides showed large amounts of fat. To look at the tumor

one would not suspect fat. In some portions there were small accumulations of lymphoid tissue.

Monroe in 1763 described the case of a man who vomited a four-prong fleshy tumor, with one pedicle. He was allowed to swallow it again, and after seven or eight months died of starvation. Monroe, Jr., described another case of the same type in 1797.

In the microscopic sections described by Professor Minski they found that the description fits the tumor they had removed exactly, with the exception that the œsophageal mucosa was very much more marked, and the papillæ were more marked in their sections than in the illustrations which he gave. But the fibrous tissue, arranged in layers, was very prominent, with a fatty layer in between, and with only one portion that looked like a clear fibroma in the specimen which upon section showed lots of fat.

In the bibliography they found the only trouble with the voice was when the tumor involved the larynx by traction on the mucous membranes pulling back upon the arytenoid cartilages.

DR B. W. SIPPY read a paper, by invitation, entitled "Diagnosis of Œsophageal Lesions," (for which see page 858).

DR WILLIAM E. SCHROEDER said as to the operation for the removal of the œsophageal polyp they succeeded in getting hold of the tumor with a pair of forceps and in putting a clamp on it, but were unable to deliver it. He thought this was fortunate in a way, because there were large vessels in the pedicle of the tumor. An external œsophagotomy was finally performed and the tumor fished out with the finger, the pedicle was clamped above and below, sutures applied to the pedicle first, and the œsophagus closed with Czerny-Lembert sutures, and the wound packed.

If these tumors lay deep down, as they did at times, in the thorax, he thought it would be difficult to remove them. Even with the œsophagoscope it was hard to see how one could grasp such a pedicle at such a long distance through the œsophagoscope.

As to trauma of the œsophagus, about eight years ago a recent graduate decided that it was necessary to wash out his brother's stomach. Accordingly, he procured a soft stomach-tube, and proceeded to introduce it. The patient, a young man twenty years of age, expressed great pain immediately the

tube came to the cardiac end of œsophagus, and the fluid was passed in. The case came to post-mortem in short order. It was found that there were no pathological changes in the lower part of the œsophagus, but that the tube had perforated the œsophageal wall and the left thoracic cavity was filled with water. Microscopical examination showed the œsophagus was perfectly normal, the stomach was normal, and the patient was normal in every sense of the word. He had eaten something which did not agree with him, and he thought it was the proper thing to have his stomach washed out. Here was a serious accident following a simple procedure.

DR LOUIS GREENSFELDER said the swallowing of foreign bodies, such as fish-bones, small particles of chicken-bones, etc., not infrequently caused abrasions of the mucous membrane of the œsophagus and produced œsophageal abscesses.

Another point was the occurrence of typhoidal ulcers at the lower portion of the œsophagus, which Dr Sippy omitted to mention.

DR DANIEL N. EISENDRATH asked whether the œsophagoscope was absolutely necessary in the diagnosis of œsophageal lesions? Also, whether it was not sufficient to use the various forms of bougies and bismuth, with the use of the X-ray, etc., in making an ordinary diagnosis of œsophageal lesions? He asked whether any microscopical examinations had been made in these cases of cardiospasm. He asked whether the administration of large quantities of bismuth in these cases and of getting an X-ray shadow of this spindle-shaped dilatation would not be a great aid?

He presented to the Society about two years ago a young man who had specific stenosis of the œsophagus. He was very much emaciated, and œsophageal bougies were arrested at about the level of the bifurcation of the bronchi. X-ray with the aid of bismuth was used, and the X-ray showed that the bismuth was arrested at about the level that the bougie was. Autopsy showed that there was no diverticulum, as was thought possible at the time, but there was œsophageal stenosis of specific origin, as was originally thought from a distinct history of syphilis.

DR SIPPY replied that the chief value of the œsophagoscope was for the removal of foreign bodies. There it became indispen-

sable A foreign body firmly lodged in the œsophagus constituted a very serious condition, unless removed it sooner or later caused the death of the patient The early use of the œsophagoscope for the removal of a foreign body must be strongly urged During the first day or two, after a foreign body had lodged, there was very little inflammation present, but after three or four days or a week, inflammation became intense, abscess formation occurred, perforation of the wall of the œsophagus was likely to take place, and above all, after a short time inflammation surrounding the foreign body made it difficult to extract So whenever a foreign body was lodged in the œsophagus in an inaccessible position, which could not be pushed down or brought up, the œsophagoscope should be used at once, and in a great many cases, not in all, the foreign body could be extracted

As to the use of the œsophagoscope in the diagnosis of lesions, relatively little aid was obtained by using this instrument in the diagnosis of diverticulum of the œsophagus At times it was possible to see the communicating point between the œsophagus and diverticulum, but one usually saw only a pouch

As to its value in differentiating cicatricial stenosis from carcinoma of the œsophagus, in most cases a diagnosis could be made without the use of the œsophagoscope, but there were cases in which a good deal of difficulty might be encountered, and in all instances the œsophagoscope was likely to render diagnosis more positive He had said in his preliminary remarks that there was great danger in assuming that carcinoma was present when obstruction existed If one looked at the obstruction and found a nodular, ulcerated, or sloughing mass, the diagnosis of carcinoma would be greatly strengthened thereby The instrument was certainly of value in cases that were not absolutely plain

In differentiating cicatricial stenosis from cardiac-spasm, the œsophagoscope he considered of value because usually the funnel-shaped stenosis produced by the cicatricial narrowing was quite different from simple muscular contraction at the lower end of the œsophagus In most cases a differential diagnosis could be made fairly certain without the use of the œsophagoscope, but there was no question that one was much more certain after using the œsophagoscope than without it

In answer to Dr Eisendrath's question, he said that micro-

scopical examination had been made when cardiospasm was present. Various theories had been advanced as to why idiopathic dilatation of the œsophagus occurred. Mikulicz and Meltzer brought forth the idea of primary spasm of the cardia. Rosenheim believed that atony of the wall of the œsophagus or primary weakness of the wall of the œsophagus was responsible for the development of the dilatation in certain cases. The proper tonus being absent, rapid eating caused undue filling of the œsophagus, resulted in sacculation and the lodgement of food, the accumulation of food irritated the wall of the œsophagus, which was likely to result in secondary spasm of the cardia.

Kraus advanced the theory that degeneration of the pneumogastric nerve was a cause of idiopathic dilatation of the œsophagus. Normally, the closure at the cardiac orifice was under the influence of two forces, one the contraction of the circular fibres of the œsophageal muscle, the other an inhibitory force which caused relaxation of the cardia under the influence of swallowing and vomiting. Fibres from the pneumogastric supplied the impulse that relaxed the cardia. Other fibres of the pneumogastric supplied the peristalsis of the œsophagus. Disease of both sets of fibres resulted in a removal of the relaxing force governing the cardia, and at the same time caused weakening of the peristalsis of the œsophagus. A paretic œsophagus and unrestrained contraction of the cardia would readily result in œsophageal dilatation. Kraus found degeneration of the pneumogastric nerve in one case. Klebs found fatty degeneration of the muscle. Round-cell infiltration of the muscle-wall had been found in cases associated with œsophagitis.

Forcible dilatation was the best method of treating cardiospasm. The passage of bougies had been followed in a number of cases by good results, but if dilatation of the œsophagus had occurred, such results were usually only temporary. It was impossible by passing a bougie to stretch the orifice, because one could not get in a large enough bougie to produce actual stretching of the muscular fibre. In many cases, if there was inflammation of the sac, when the bougie was passed it irritated the œsophageal wall, and spasm was increased by passing the bougie. This was true in the case spoken of by Dr. Graham. In this case any attempt made to pass the bougie was followed by greater spasm.

Other means had been devised to stretch the cardia. Rosenheim and others resorted to the use of rubber bags that were introduced to the seat of stricture, and filled with air or water. When the rubber bag was distended with air or water, expansion of the rubber took place at the point of least resistance, which was downward into the stomach, and upward into the dilated œsophagus, so that insufficient pressure was exerted at the point where the greatest stretching was required. This, however, did more good than the passage of bougies. Rosenheim resorted to this method successfully in one or two cases. Mikulicz did a gastrostomy in a case which was approaching inanition, hoping that by putting the œsophagus absolutely at rest the spasm would be relieved. After a period of two or three years, no influence having been exerted upon the spasm, he cut into the stomach and forcibly dilated the cardia with an instrument on the order of a uterine dilator. The symptoms were relieved. He operated subsequently on three other cases, and, according to the last reports, the results were good. Since then other surgeons had adopted the same means.

Dr Sippy mentioned the manner in which he treated the case referred to by Dr Graham, and two other cases.

He had constructed a dilator which consisted of a rubber bag, about three and a-half inches long, encased in a silk bag, which limited accurately the distention produced. When inflated with air the circumference of the silk bag was 15 cm. The dilating force was accurately controlled by the silk bag, and the maximum pressure exerted at the point desired. The bag was introduced and held in position by a bougie. When collapsed and surrounded by a condom to prevent friction, the greatest diameter of the instrument was about half that of an ordinary stomach-tube. By altering the size of the silk bag any degree of dilatation desired could be readily accomplished. No anæsthetic was required, and the serious operation of Mikulicz was obviated. In the case referred to by Dr Graham the œsophagus held 500 c c. For three months previous to using the instrument the patient had been unable to take nourishment except through a stomach-tube, by means of which she was fed four times daily. The bag was used twice, and the obstruction was at once relieved. Since then he has dilated two other cases. One was a student

of the University of Illinois, whose œsophagus held 400 c c His trouble had lasted for three years, during which time he had lost a great deal in weight In another case one dilatation was sufficient to relieve the symptoms for a period of six months After a drinking bout there was a slight return of the spasm, and dilatation was again performed, with complete relief One could readily see how the œsophagus might vary in size, and that a greater degree of dilatation might be required in one case than in another It was possible to dilate the cardia efficiently and accurately without resorting to gastrostomy

PANCREATIC CYST

DR EDWARD H OCHSNER exhibited some concretions removed from a pancreatic cyst The patient presented a tumor in the left hypochondrium, which caused no special discomfort, except that it was slightly tender on pressure and alarmed the patient because of its presence The patient had very thick abdominal walls, and although the diagnosis could not be made positively a probable diagnosis of pancreatic cyst was made At the operation a cyst was found containing 700 c c of straw-colored fluid and three softish, irregular, yellow concretions, pea-sized and slightly larger concretions

In conjunction with this case he presented a trocar which he had used in withdrawing this fluid without spilling a drop He said there were many similar trocars on the market, the only difference between this and the others being that this always worked, while the others rarely ever worked after they had been boiled three or four times The reason why this trocar always works is because both the tube and the stilet are made of gun-metal and are made with the same care and in the same manner as an ordinary all-metal syringe, while the ordinary trocars on the market depend for their vacuum-producing power upon packing, which is ruined by a few boilings The instrument exhibited had been used for four years, boiled with all the other surgical instruments probably a thousand times, and is working just as well to-day as it did when perfectly new The instrument was originally described in the May, 1903, number of the ANNALS OF SURGERY

DIAGNOSIS AND TREATMENT OF COXA VARA

DR JOHN L PORTER read a paper entitled as above

DR WALLACE BLANCHARD had come to the conclusion that much confusion could be avoided by classifying these cases as false and true coxa vara. One class of cases that would come under the head of false coxa vara Dr Porter had not mentioned, and that was the coxa vara of infantile rickets, and these cases would be frequently seen. In the last five years they had had twelve cases of coxa vara from infantile rickets at the Home for Crippled Children. These cases were pronounced in every instance. The patients stood with a marked tilting of the body, but walked without limping. Skiagrams in several of these cases showed deflection downward of the neck and depression head of the femur. Adult cases of coxa vara, with a history of the condition having existed from childhood, should be classed under the head of the false coxa vara of infantile rickets. Again, under the head of false coxa vara he would place all cases of sudden onset—those cases that came on with sudden pain. He believed they were all cases due to traumatism. They were either cases of epiphyseal separation or of fracture, more or less impacted.

A case of Dr Greensfelder's was presented to the Society a month ago, which in the speaker's opinion was a clear case of impacted fracture of the neck. The head and neck were deflected downward, but there was a distinct fracture line. He would put all cases of impacted fracture in which a skiagram showed fracture, all cases of epiphysealysis, and all cases with sudden onset of pain, and any history of traumatism in which deformity came on suddenly, along with cases of infantile rickets, under the head of false coxa vara.

Then it was essential to give the conditions under which true adolescent coxa vara existed. The process was one of years. At first it was imperceptible. The patient or his friends would notice a slight limp. A year later they were sure that the patient limped in walking, and two years later there would be a distinct shortening of half an inch or more, and in the succeeding five or six years there would be a gradual increase. This was the case with the patient who had bilateral coxa vara, and whom he had exhibited at a previous meeting. Commencing at seventeen, the patient now being twenty-one, the condition had gradually

increased Abduction deformity in one year had increased about ten degrees in one hip In the other hip the neck was about horizontal True adolescent coxa vara was a gradual, almost imperceptible, remoulding of the neck and a gradual depression of the head In Dr Blanchard's case the diphtheria, which the patient had at the age of seventeen, probably had the effect of weakening bone structure, so that it failed to carry the weight of the body and gradually there was a remoulding under pressure A weak epiphysis occasionally happened He had a case of epiphysealys about two years ago in a Grattan osteoclast, and the patient was still under treatment He expected at the time to do a supracondyloid osteoclast He had made something like two hundred supracondyloid osteoclasts, in which the epiphysis had an opportunity to separate, but this was the only case he had had in which it had occurred He felt that weak epiphyses would occasionally occur, and he supposed those separations occurred in the hip the same as they did in the knee Dr Porter had shown one such case Cases of separation of the epiphysis of the head of the femur should be classed under the head of false coxa vara

Dr Porter had said truly that cuneiform osteotomy relieved the adduction deformity and was an ideal operation, but the same question came up here that arose at the last meeting, and Dr Porter had not answered it Dr Blanchard had recently presented a patient to the Society whose case had been progressing for five years, and in whom adduction deformity had increased about ten degrees, and shortening had increased in both legs, undoubtedly because of more depression of the head than obtained years ago At what stage in the disease in such a case were we justified in doing cuneiform osteotomy? Dr Blanchard said that his patient was ready for an operation at any time If he did a cuneiform osteotomy and the disease was progressing as it had progressed for five years, while he thought he might get a good result from the osteotomy, he would lose that result completely in two years The question arose, and was yet unanswered, When could we perform osteotomy on a progressive case with a result that would remain permanently good? This question he had not settled in his own mind, and said it was an open one, and when the various forms of false coxa vara were excluded

and the cases were simmered down to the one class of true adolescent coxa vara, which were slowly progressive, the question of operative procedure was of vital importance to the patient and of great concern to the surgeon

DR LOUIS GRELNSFELDER remarked in regard to a case of coxa vara which was presented to the Society for him by an interne two months ago, that it presented the aspects clinically of the cases shown by Drs Blanchard and Porter. The patient sustained a slight traumatism, but was able to be up and around, with slight limp. Nothing further was noticed for six months, when deformity was observed. This deformity was progressive for one year after it was first noticed. When the patient was exhibited to the Society it was two and a-half years after the injury, one year after the deformity was noticed.

DR PORTER referred to rachitic coxa vara in infancy. Whitman had called attention to the fact that a slight bending downward of the neck due to a rachitic affection of the joint in infancy passed unnoticed, because of the relatively shorter and thicker head and thick tissues about the hip. In fact, it was hard to distinguish a slight affection of the hip-joint in a child, and they oftentimes walk without a limp. When a patient reached the age of thirteen to fifteen, the slight bend in infancy resulted in an increasing strain upon the joint, and the rachitic distortion of the neck in infancy might be the determining cause of greater depression of the neck in adolescence. Up to the time Dr Blanchard began his investigation of rachitic joints with the X-ray, recognition of these rachitic bends at the hip in children was not made. We were very much at sea as to when the disease starts. In Dr Blanchard's case the disease seemed to be progressing. Dr Senn had reported one case which began at the age of thirty-nine, and was forty-two when distortion was recognized.

As regards osteotomy, he did not see why a patient would not be just as well off with the leg abducted in a splint or plaster-of-Paris cast after osteotomy of the femur, because the femur in healing would be in better relation to the axis of the neck, and when the operation was completed, when union took place, the normal angle of the neck to the shaft would be practically restored, which, in a measure, precluded further development.

of the deformity He was rather inclined to think that it was not poor surgery to operate upon these cases when the neck of the femur was bent in a boy, 18 years of age, on the supposition that as he grew older his tissues were going to get older, and he had a better chance of restoration of the normal axis than in trying to get well with the weight still borne at an acuter angle than normal, with greater strain on the neck

Dr Blanchard's case was the first one in which diphtheria was mentioned as being the possible determining cause He did not see why any of the infectious diseases occurring at that time of life might not be a determining cause

Referring to Dr Greensfelder's case, in which he (Greensfelder) said the patient sustained a slight traumatism, which was followed later by deformity, he would say the epiphysis separated, but that it did not separate completely, it simply allowed the neck to slide down on the inner side, and there was constant inflammation and an attempt at restoration of function was kept up, and Whitman had pointed out that the neck was very apt to bend beyond the epiphysis where the softest part of the neck is In Dr Greensfelder's case he did not see why a slight traumatism should not be the true determining cause of coxa vara, a true bending of the neck, and why should we try to differentiate these cases from other cases so far as the diagnosis and ultimate function of the member were concerned? Any kind of traumatism in a boy might develop separation of the epiphysis, because of the tremendous strain that came from the bending of the neck downward, and finally there was a pushing off, with the same condition developing as in the case of Dr Greensfelder and his own at the start

SINGLE KIDNEY IN MEDIAN LINE WITH TWO URETERS

DR D A K STEELE reported the case of a man, 32 years of age, who presented himself with a history of stomach trouble, nausea, vomiting, and some distress for a period of three years About three months before he came under Dr Steele's observation he developed a direct inguinal hernia In two or three weeks a similar hernia appeared on the opposite side Patient came for the purpose of an operation to be cured of his acquired direct double inguinal hernia He was sent to the West Side Hospital

and prepared for operation. When the patient was under the anæsthetic and Dr Steele was ready to begin the operation for hernia, in running his hands over the abdomen just below the umbilicus, he discovered a somewhat kidney-shaped tumor. This tumor was freely movable from side to side, and painless. He examined the patient before he was anæsthetized, and there was no pain on pressure. The tumor was located below the umbilicus a little more to the right than to the left. Before doing the hernia operation he made a slit over the tumor and opened the abdominal wall and found that the tumor was retroperitoneal. It was kidney-shaped and apparently was a kidney. He slipped his hand up under the right kidney region and found no kidney there. There was nothing below the liver on the right side, only an empty space. There was a central tumor slightly movable, but it had no very great amount of excursion. The thought then occurred to him that as this was a kidney in the median line perhaps it had always been there, it might have found a new dwelling-place. He examined the left side for the left kidney, and found no kidney there. The man had this single, rather large kidney, which apparently had always occupied the position in the median line. The question arose whether the man had two ureters or one ureter. He thought for scientific purposes he had carried the examination far enough. He closed the wound in the abdominal wall without deciding that point definitely, thinking it could be decided later on by the introduction of catheters and by taking a skiagraph. He did a herniotomy, and a couple of weeks afterwards, when the man was convalescent and about ready to leave the hospital, he invited Dr Kreissl to use his illuminating apparatus, cystoscope and ureteral catheters, and to examine the bladder to see if there were two ureteral openings leading into the bladder, and to introduce, if possible, metallic ureteral catheters, so that a skiagraph could be taken and determine whether there was one or two ureters. Dr Kreissl did so. Some difficulty was encountered in introducing the cystoscope, on account of a small meatus and moderately tight urethral stricture. Under cocainization, without a general anæsthetic, the bladder was explored and two ureteral openings were found. The cathether was introduced on one side with some difficulty, and then an attempt was made to introduce a

second catheter, which would only enter the ureteral opening, but would not go in more than three-quarters of an inch. The man complained of considerable pain, from the stretching of his urethra, and they desisted without taking a skiagraph at this time. Dr Steele arranged for a subsequent examination three days later, and was ready to make it, but the man objected, and said that he would leave the hospital if he were subjected to another such examination. Dr Steele declined to see him for two or three days, but before he left the hospital the patient sent word that he was anxious to have another examination. He made another appointment with Dr Kreissl, who, he said, would give the result of the second examination to the Society.

Dr Steele exhibited the skiagraphs that were taken following the second examination by Dr Kreissl.

DR F KREISSL said the case reported by Dr Steele illustrated the great value of the combination of sounding the ureters and of photographing the metallic sounds in position, or the combination of catheterization and radiography, as originally devised by A B Johnson, New York, in 1899, and almost simultaneously by Loewenhardt, in Berlin. It also demonstrated the weak points of intravesical segregation of the urine.

He was called to see a case by Dr Cuthbertson to catheterize the ureters for a functional test of the right kidney, because he (Cuthbertson) had found a very large tumor of the left kidney, and wanted to remove this kidney. He passed the cystoscope and found only one ureteral opening on the right side. He passed the catheter in the ureter and took sectional samples of the urine. At about two inches above the ureteral orifice, he got a slightly cloudy urine, which contained pus. After passing it four inches up the ureter he got clear urine. He could not see another ureteral opening. In this case there was no ligamentum inter-uretericum. He left an ordinary catheter in the bladder and the ureteral catheter in the pelvis of the kidney for three hours, collecting six ounces of urine from the ureteral catheter and none from the bladder. It seemed then that there was only one kidney, and that an operation could not be done. Dr Kreissl then suggested leaving the catheter *in situ* and, after injecting bismuth emulsion through the catheter, having an X-ray picture taken. If then a shadowgraph showed a shadow to the left side, one

would be almost sure there was only one kidney and one ureter. The shadowgraph showed the ureteral catheter in position on the right side up to the right kidney, which permitted the conclusion that the patient had two kidneys. This taken together with the findings of the urine indicated there was trouble on the left side and apparently a fork-shape insertion of the left ureter into the right one by crossing the spine. The patient was a woman, 68 years of age, who had an enormous pyonephrosis, there being practically no kidney tissue left. Considerable pus was encountered in opening the kidney, and a stone was found lodged in the upper end of the ureter.

In the case reported by Dr. Steele there were two ureteral orifices in the bladder in the normal position where they are usually found. There was urine coming from both ureters, yet there was only one kidney. It remained to be proven whether these two ureteral openings led to one or two kidneys. The only possibility of establishing this fact was to take an X-ray picture. On a glass plate these shadows showed much more distinctly than they do in the print. In measuring the distance from the ureteral opening to the renal pelvis, he found twenty centimetres on the left side, and about eighteen centimetres on the right side, and in the picture on the glass plate the ureters are seen converging toward the median line.

Dr. Kreissl considered the possibility of making a mistake in judgment when using intravesical segregation in these cases, and spoke of the superiority of catheterization in combination with the X-ray. In a case like that of Dr. Cuthbertson's, where there was only one ureter, if one obtained a specimen of the urine by intravesical segregation, even preceded by a cystoscope survey of the bladder, one was unable to say whether there were one or two kidneys. In the other case there would be two working ureteral openings suggesting the presence of two kidneys, eventually leading into a disastrous nephrectomy. He said that Johnson, of New York, and Loewenhardt, who had devised this combined method, employed a lead stylet enclosed in an ordinary ureter-catheter. The bougie which he had seen used for this purpose quite frequently led to false diagnosis. At the narrowings of the ureter it was liable to be caught. When one introduced such a catheter into the ureter, and it was caught some-

where in a fold or at any of the anatomical narrowings, it would kink, and one would not be able to pass it farther, then if an X-ray picture were taken, one would see that the sound was coiled up, and this would lead one to make a diagnosis of stricture or even of a stone when there was none. The value of this method to determine enlargement of the pelvis of the kidney was problematical. If one should happen to enter the renal pelvis with a lead bougie, such as he had mentioned, it would likely coil up in such a manner that it would indicate a much distended renal pelvis. But it was not necessary to use it, because if there was a distended renal pelvis and the ureteral catheter entered the renal pelvis, urine would first escape as if it came through the ordinary catheter from a full bladder, and from the quantity of this urine one could determine the size of the distended renal pelvis. For sounding both ureters simultaneously it was better to use a bougie flexible and the end sufficiently bevelled so as not to injure the ureter, which the lead bougie was likely to do. For simultaneous catheterization, which was necessary in Dr Steele's case, he found this cystoscope insufficient.

To obtain urine from both kidneys separately, smaller-sized catheters would be sufficient, but when larger-sized bougies or catheters were used, which are armed with a lead stylet inside, great difficulty would be encountered in passing both and in obtaining a shadowgraph of both sounds in the ureters at the same time, because of too much friction between the two moist catheters.

BOOK REVIEWS.

A TREATISE ON FRACTURES AND DISLOCATIONS By LEWIS A STIMSON, B A , M D , LL D , Professor of Surgery in Cornell University Medical College, New York, Surgeon to the New York and Hudson Street Hospital, etc New (4th) edition, thoroughly revised Octavo, 844 pages Lea Brothers & Co , Publishers, Philadelphia and New York, 1905

In the fourth edition of Dr Stimson's work, which follows the preceding edition after five years, the chief changes have been made in the following directions In the study of the forms of fracture in the vicinity of joints by means of the Rontgen rays , in the more frequent resort to open operation in fractures, in the more extensive application of the Rontgen rays to diagnosis, thereby enabling more systematic classification and description, especially in the fractures and dislocations of the carpal bones , in the largely rewritten section on fractures of the lower end of the humerus in the young, in the reduction of old dislocations by open measures, and in many new illustrations added or substituted for the old

The work of Dr Stimson has long been highly esteemed There is a terseness of expression and a practical way of putting the storehouse of accumulated information which it contains that are very readable and very instructive The arrangement of the matter has been carried out upon an anatomical basis—and this systematic method of presenting the facts has made the imparted knowledge easier of understanding and retention The bringing to bear of the Rontgen rays upon questions of diagnosis, and upon the corroboration of the opposition of broken bone-ends

and dislocated joint-ends accomplished by manual methods, has been well carried out. The matter of treatment by the various forms of splinting and postural methods is excellent and is generally well illustrated. The pathology and mechanism of fractures and dislocations are explained and pictured plainly.

The one direction in which the present writer would say there is need of dealing with in greater detail, is upon the application of the open method of treatment to those cases of fracture and dislocation where the ordinary methods prove inefficient. As already mentioned, greater attention than heretofore is given to this important subject,—and more to Dislocations than to Fractures,—but not as much attention, in detail, it would seem, as the subject deserves. This is the newest line of the application of surgical science to this category of traumatisms, and it would appear that enough trustworthy and creditable work has been done along these lines to make possible the working-out of more specific and definite technical details applicable to the more common fractures and dislocations, elaborating a distinct operative procedure to expose the ends of the broken or dislocated bones, in connection with the safe avoidance of important structures on the way to the site of trauma, together with the manner of dealing with the special conditions found. The time will undoubtedly come when definite operations for classically-recognized fractures and dislocations will be described and illustrated. Many men, especially those who operate less frequently, would operate more frequently if the technic of operation were more clearly laid down in individual and specific fractures and dislocations rather than generalized, and that often briefly and without detail, at the end of chapters or subjects.

A new and useful method of utilizing the corroborating power of the Rontgen rays in the putting into apposition of broken or dislocated bone-ends, not noticed by the writer in the review of the work, is the following. The patient lies upon a

wooden table of medium height, the Crookes-tube is placed beneath the table, and the surgeon, wearing "fluoroscopic spectacles" (a special form of fluoroscope strapped to the head), with hands thus freed, bends over the involved lesion, making and retaining the adjustment of the bones during the application of a retentive appliance, every step of which application he is thus able to watch, as to its bearing upon the disrupted bone-ends

WARREN S BICKHAM

FINDLEY'S GYNECOLOGICAL DIAGNOSIS A Treatise on the Diagnosis of Diseases of Women For Students and Practitioners By PALMER FINDLEY, B S, M D, Assistant Professor of Obstetrics and Gynecology, Rush Medical College Octavo, 588 pages Lea Brothers & Co, Philadelphia and New York, 1905

All who are interested in gynecology realize the need of suitable works on this important subject There should be, first, comprehensive treatises on the pathology of the subject, secondly, on the diagnosis of gynecological conditions, and, finally, on the treatment of these conditions, both operative and otherwise While all three phases of this subject can be, and usually are, treated in one volume, it would seem best to have one or more authoritative treatises on each of its important phases The need of such treatises in gynecological pathology are most urgent, for these should be the foundation of both the diagnosis of gynecological conditions and also their treatment The lack of this foundation is most apparent to anyone reviewing the many gynecological text-books It has caused not only an absence of uniformity among the different writers but has also, at times, led to the artificial and erroneous classification of diseased conditions and their treatment, as, for example, let any one compare the subject of endometritis as discussed in any six of our modern text-books and note the lack of uniformity in the classification and pathology of this condition

The writer of the present volume has covered the first two phases of the subject by considering the question of the diagnosis of gynecological conditions in connection with the pathological changes giving rise to these

The first part of the present edition, consisting of 123 pages, is devoted to the consideration of the general diagnosis of gynecological conditions,—*i. e.*, the history of the case, the symptoms peculiar to gynecological cases, and the methods used in the examination of the patients and in the determination of the cause of the trouble. In Part II, consisting of 360 pages, the special diagnosis of gynecological diseases is considered, and Part III, of 88 pages, is devoted to the diagnosis of the diseases of the urinary system.

The work is thorough, systematic and well indexed, and the illustrations show what the author wishes to emphasize. The publishers state that the first edition has been exhausted and that the present represents a thorough revision of the previous one, with the addition of nearly 100 pages of text, 12 engravings and 14 colored plates. The work can be recommended as the best we have in a field where such a work is greatly needed and in which there are too few contributions.

JOHN A. SAMPSON

CORRESPONDENCE

THE TRANSVERSE INCISION IN APPENDICITIS

EDITOR ANNALS OF SURGERY

Since the publication in the issue of the ANNALS of January, 1906, of my article on "A transverse incision for the removal of the appendix," I have received from Dr H Chaput, of Paris, France, a note stating that he had published a memoir in June, advocating the same procedure. A search of the Index Medicus failed to reveal the article and it was only by accident that later I found it in *La Presse Médicale*, June 3, 1905. After describing the incision external to the rectus he says "*Chez les hommes, le muscle droit est peu éloigné de l'épine iliaque, J'incise alors horizontalement la partie externe de ce muscle sur une longueur de 1 à 2 centimètres environ*" (in men the rectus muscle being but a short distance from the iliac spine, I therefore incise the external part of that muscle for a distance of about one or two centimetres). That the two procedures resemble each other is evident, that they are identical is, I think, doubtful.

It is needless to say I was in ignorance of Dr Chaput's article or I would have mentioned it. How it came to be omitted from the Index Medicus I do not know.

GWILYM G DAVIS

PHILADELPHIA, May 7, 1906

All contributions for publication, books for review, and exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, New York.

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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

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Read at the Meeting of the American Association of Railway Surgeons, Chicago, Oct. 4-6, 1905. Abstracted from the Railway Surgical Journal, Vol. XII, No. 3, p. 104, November, 1905.

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REPORT OF CASE OF VALVULAR HEART TROUBLE

January 10th, 1902

Mrs S, aged 56, weight 225 when in normal condition, has been unable to lie down for four weeks, though able to walk about the house to a limited extent, until within the past ten days.

Dyspnoea distressing and constant and worse at night.

Heart-action from 100 to 110, feeble and remittent.

Urine scanty, with slight amount of albumen.

The tissues of the body generally filled with serum. The limbs are enormously distended to the thighs, the abdominal cavity containing much fluid, the face oedematous.

The case having been treated by two skillful physicians with no improvement, a change was decided upon after the diagnosis of fatty degeneration of the heart with prognosis of "No hope" had been announced.

Upon examination of the case, I added to the diagnosis already made that of dilatation with little compensation.

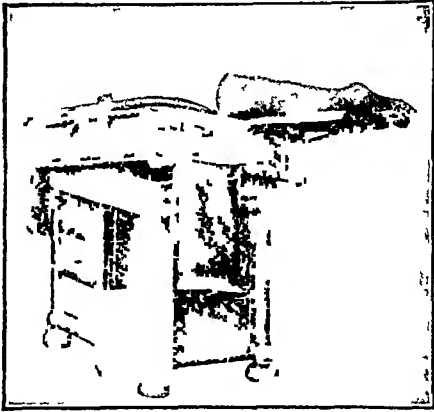
Frankly, I also felt that the possibilities of recovery were slight. Commenced the treatment with no change in the remedies save the exhibition of morning doses of Elaterium, which secured copious watery evacuations. This reduction of the anasarca together with the administration of the usual heart remedies seemed to give but little relief to the dyspnoea. In about ten days I dropped all former remedies save the Elaterium and occasional doses of Strichnia, and commenced giving Anasarcin, which to me was an untried remedy at this time. I got such prompt relief within a few days that the patient had to admit an improvement. The heart's action became quiet and regular at 90. This treatment was continued for two or three months, when I ceased visiting her, as a visit involved a trip of 25 miles and return.

She remained in good health for over a year, requiring no medicine in the meantime. A cold with severe cough caused a recurrence of the disturbed heart-action, with gradual appearance of the old train of symptoms. After control of the cough was effected, Anasarcin alone completed the cure. This cure has been permanent up to the present.

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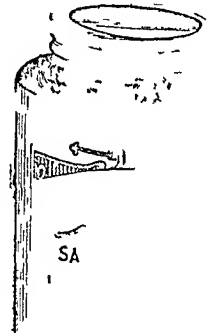
phlogistine, and altogether over 100,000 pounds were shipped to the coast upon order within a week.

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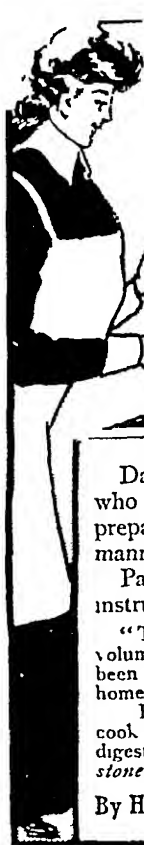
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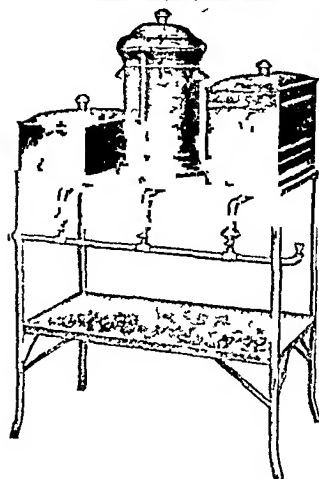
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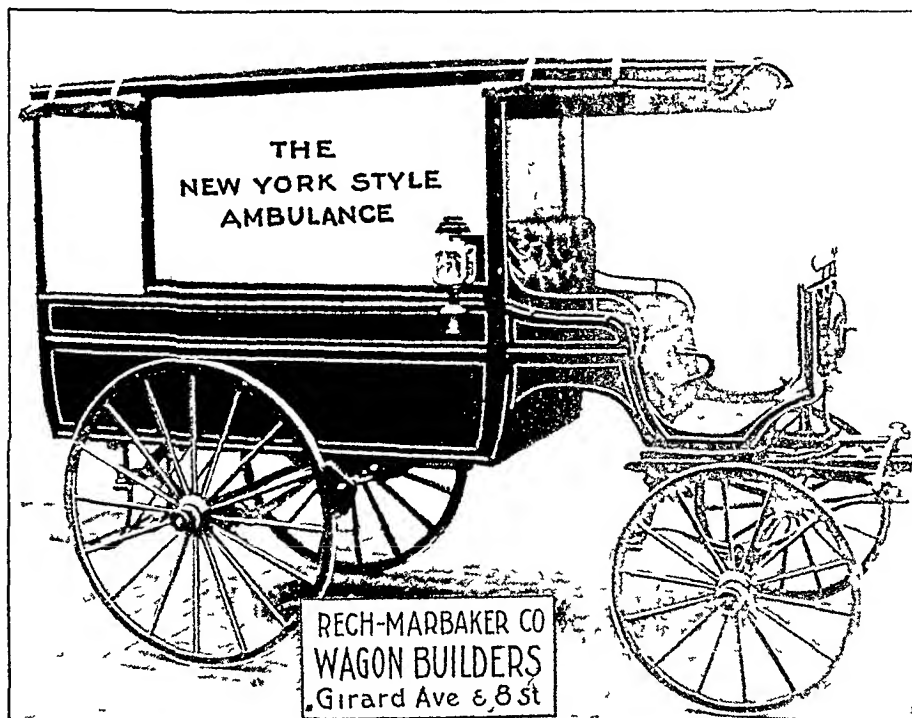
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